the OIL AND GAS JOURNAL
MAY 6, 1957

How to use the Digital Computer...

Automatic Fractionator Rating---

A really practical plate-to-plate program

P. 103

★ ★ Exclusive interview with Oren Harris ★ ★

CAN GAS BILL PASS?

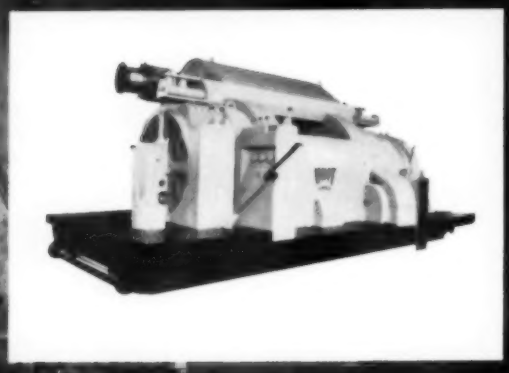
Yes, Harris tells Journal, with strong support from Ike, industry.

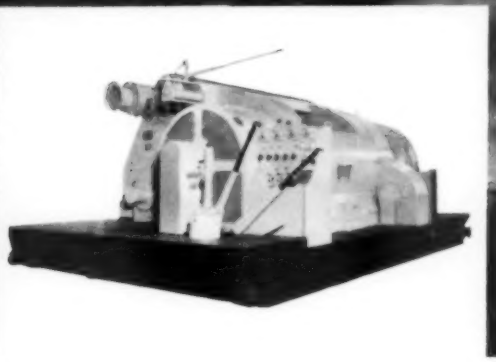
p. 78

Gas Operates Factory-Built L.A.C.T. Unit p. 98

outstanding performers in

Offshore Operation





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JOURNAL News Letter

May 6, 1957
Tulsa, Oklahoma

Independent oil men are persuaded Eisenhower means business:

Officials of I. P. A. A. close to the Washington scene tell oil men they think some definite limits on imports are coming. What's more they anticipate results of the joint ODM-Eisenhower moves in a matter of weeks--not months.

The administration action spiked some big noise which was building up for the Biloxi convention of I. P. A. A. The independents were preparing to start a move for Congress to write a stiffer law to control imports. They were convinced then that nothing was going to be done by Eisenhower.

But these plans are now shelved for the time being. Strategy of independents is this: Don't embarrass Eisenhower. Wait and see how he handles the situation. If this is ineffective, producers will take their case to Congress in 1958. Many in that event are expected to favor specific quotas combined with a tariff.

ODM Chief Gordon Gray is wasting no time finding out if the importers will voluntarily cut back. He's now holding person-to-person talks with officials of these companies. He can tell within a few weeks whether voluntary cutbacks have a chance. If they don't, then it's Eisenhower's next move (P. 75).

The enigma of imports has oil crystal gazers seeing double. The I. P. A. A. supply-demand committee last week came out with two forecasts on domestic production for the last half of 1957. Here they are:

If imports are kept within the 1954 formula, domestic output will be 7,517,000 bbl. daily. If imports aren't controlled, domestic production will average 7,034,000 bbl. daily. In any event, production will slip below the 7,567,000-bbl. estimated average for the first 6 months.

There's a sense of urgency about the Harris-O'Hara natural-gas bill.

Rep. Oren Harris, in an exclusive interview, says this may be the industry's last chance to win freedom from price controls for gas producers. If this bill fails, future chances appear hopeless. He reasons the FPC will be forced then to act under the present law. When that happens, it'll be too late to turn back the clock before producers and consumers both are hurt.

Chances for the bill are excellent, Harris thinks--if the White House and

all elements of the industry support the measure (P. 78).

This support finally is gathering. The I.P.A.A. has endorsed the bill as the best available. And one giant distributor--Consolidated Natural Gas--which opposed the bill 2 years ago, announces it will support the present proposal.

Management is on notice it has no choice but to rely more heavily on automatic-control machines in the future. It'll be forced into this position by a growing population that will be made up of a larger percentage of people too old or young to be in the labor force.

Automation will be the only answer. These machines will allow a comparatively smaller working force to turn out goods needed to maintain the nation's rising living standard. That's the estimate of what's ahead by a top oil man--Harold Osborn, senior vice president of Continental Oil. He spoke before an automatic-control conference last week at Norman, Okla.

EXPLORATION: Phillips has an important strike in Canada. Its 1 Kaybob, 145 miles northwest of Edmonton, flowed at rate of 2,350 bbl. daily through small choke. Flow was from 45 ft. of porous reef in Devonian-Cooking Lake formation. The discovery apparently is another link in the Virginia Hills-Swan Hills Devonian reef trend shaping up north of the general Windfall-Whitecourt area. Nice aspect of the strike: It's only 9 miles from a crude line connecting Sturgeon Lake field with Trans Mountain pipeline system.

Three U.S. oil companies have a 1,232,000-acre concession in Bolivia. The grant is in the southeastern part of the country east of the Andes. It will be explored as a joint venture of Ohio Standard, Pure, and Hancock. Earlier Gulf received a 4,000,000-acre concession in Bolivia.

West Germany has two small, but significant wildcat discoveries in the Upper Rhine Valley. One is 5 miles north of Karlsruhe and the other 10 miles southwest of Germersheim.

DRILLING: Investigators have turned up an interesting fact about Phillips' wild well. The test, 3 Hospah, south of Farmington, N.M., went out of control and burned last month. Freakish delayed action of the blowout preventer now is credited with bringing the well under control.

Here's what happened: The well blew and flashed when a connection broke while it was being sand fractured. Flames made it impossible to activate the preventer. But heat from the well triggered the blowout device, and it automatically shut off the flow. Loss of drilling and other equipment reached $1 million, but the well was put into production 10 days later.

Detailed reports on turbodrilling tests in this country have been given the industry. They boil down to this: The turbodrill is a whiz at drilling hole faster than the rotary. But its tendency to wear out bits faster is restricting the new tool's economic potential right now. Turbodrill penetration rates are 1-1/2 to 5 times rotary. Bit footages, however, are from 70 per cent of rotary for large-size bits to as low as 30 per cent for smaller bits. Dresser is pushing hard to come up with a tough, high-speed bit especially in sizes under 9-7/8-in.

The centrifuge has been used around drilling rigs now for 4 years. Most

drilling experts agree it results in better mud, faster hole, less labor, lower costs. Some interesting case histories and statistical studies now bear this out (P. 124).

First tender carrying equipment to generate and use a.c. power to run a.c. motors on drilling equipment is Delta Marine's Joseph Zeppa. Advantages of this power are low cost, easy control, cheap maintenance, flexibility of power (P. 120).

PRODUCTION: The nation's productive capacity is still climbing. The industry could produce 10,100,000 bbl. daily on January 1 this year. This is 350,000 bbl. daily or 3.5 per cent above the same time last year. Capacity for 1958 is now estimated at 10,420,000 bbl. daily. Statistics mean the nation actually has only 1,793,000 bbl. daily stand-by production for an emergency since actual output for January was 8,307,000 bbl. daily.

Engineers are warning that miscible-phase flooding will not achieve sensational recovery in every case. They say the miscible-phase process will recover all the oil in any region it sweeps. But physical factors may reduce this considerably, especially in a horizontal reservoir with layers of differing permeability. The danger here is that breakthrough will occur in higher permeability layers before complete flooding of the low permeability layers. A plan advanced to counteract this is to run the miscible slug followed by gas and then a water flood.

Oklahoma operators are holding a series of idea-swapping meetings with State Conservation Director Massena Murray this month. Murray is seeking industry recommendations and criticisms of a planned Corporation Commission order tightening up conservation in the state. New field rules plus stricter controls over secondary-recovery production are in prospect.

Free-world crude production is now topping pre-Suez levels. The report for February shows output hit a new record of 15,244,200 bbl. daily during the month. This is a gain of 462,500 bbl. daily over January. It also is 26,400 bbl. daily over the previous high mark set last October just before the Suez crisis. Heavy production in the U.S. and Venezuela plus revived Middle East activity accounted for the quick comeback.

A new design for a lease automatic custody transfer unit turned out by Pan American Petroleum Corp. may interest other operators. It's a low-cost packaged unit and fully automatic. Principal differences are: It's pneumatically controlled with no outside source of electrical power; factory fabricated; and simply designed with a minimum of valves, controls, and other parts to wear out (P. 98).

PIPELINING: A new method of analyzing pipeline pressure-surge problems is being advanced by two experts. It's based on a mathematical approach. Tests have shown the method aids the pipeline designer predict points of extreme fluctuating pressure. This will mean better over-all designs and big savings in pipeline construction (P. 112).

Pipeline expansion programs have been eliminated from the ODM list of projects eligible for quick tax writeoffs. Pipelines have been limited for some months to projects directly tied in with military needs.

The French for the first time have tapped the Laco gas fields. This area in southwestern France may become the nation's greatest source of industrial power. A desulphurization plant at the field is now on stream, funneling gas into a pipeline system serving southwestern France. Output is expected to be 232,000 M.c.f. daily by year's end and will be doubled by 1962.

Plans are being made for a 393-mile, 12-in. products line from Moundsville, W. Va., to Newark, N.J. if the Little Big Inch is converted from gas to products. The new line would take L.P.G. from the Little Big Inch of Texas Eastern Transmission and move it to refinery, petrochemical, and heating markets in the east. Project is being planned by Underground Storage & Exploration.

Service Pipe Line is going outside Indiana Standard operations for the first time. It is combining with Aurora Gasoline Co. to build a 165-mile, 10-in. crude line from Griffith, Ind., to Muskegon, Mich. Line will service the Aurora and Naph-Sol refineries.

Panhandle Eastern Pipe Line has curtailed its search for new gas reserves. The reason: Uncertainty over the pricing method which FPC will use. Panhandle is channeling more of its activity into oil finding as a "good sound business practice."

Coastal Transmission should complete financing this month for its natural-gas pipeline system from McAllen, Tex., to Baton Rouge, La. This is the last hurdle for the project which will deliver gas to Houston Texas Gas & Oil at Baton Rouge for transport to Florida markets.

REFINING: For the first time, a survey of octane ratings for superpremium gasolines is available. Ethyl Corp.'s April report shows individual ratings ranged from 100 to 100.6 R.O.N. in 28 samples in 15 cities. Some stepped-up premium grades also showed ratings in the 100-plus class.

Radiation processing is going big-time. The swing now is to nuclear research aimed at finding out how radiation can effect or promote desirable hydrocarbon reactions. This work has used isotopes, accelerators or spent-fuel elements as the sources of radiation. Word now from A.E.C. is that oil companies soon will build labs to study effects of neutron radiation. This gives sledgehammer effects as compared with present experimental sources.

Kerr-McGee is still expanding. The Oklahoma company now has gained access to 11 refined-products terminals and marketing outlets in 15 states from Wisconsin to Florida. The expansion was achieved by acquisition of Triangle Refineries, Houston, through a stock-exchange deal.

Pacific Northwest Pipeline is dropping plans to expand into refining, marketing, and transporting refined products. The integration plans are being shelved following the company's merger with El Paso Natural Gas. This means a proposed 350-mile crude and products line from the Four Corners area to Salt Lake City is dead.

The medium-speed digital computer is becoming the work horse for many calculations requiring trial-and-error procedures. A practical plate-to-plate program for rapid automatic rating of fractionators is discussed on page 103.

Royal Dutch-Shell will invest $170 million in West Germany during the next 4 years on refining, pipeline, and petrochemical projects. Biggest chunk of the investment will go into a 70,000-bbl. refinery between Cologne and Bonn.

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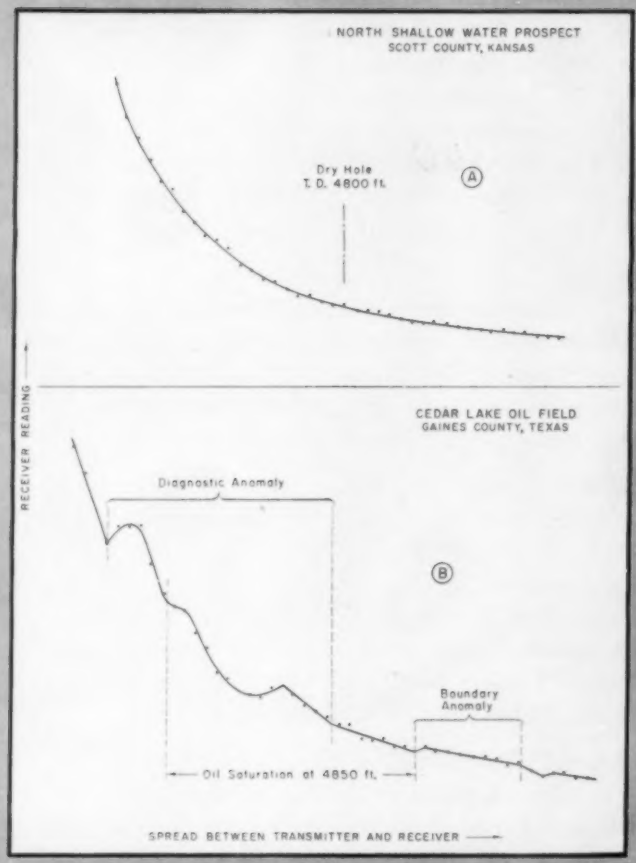

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THE STAFF

TULSA OFFICE
211 South Cheyenne Ave.
Phone Diamond 3-6291

Kenneth B. Barnes ..... Editor
Henry D. Ralph ..... Chief Editorial Writer
Ted A. Armstrong ..... News Editor
Gerald L. Farrar ..... Engineering Editor
Dr. Frank J. Gardner ..... Exploration Editor
Paul Reed ..... Pipeline Editor
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Ailleen Cantrell ..... Editorial Assistant
C. Dudley Johnston ..... Art Director
Jo Jeanne Speaker ..... Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-6160

George H. Weber ..... Refining Editor
Paul Swain ..... International Editor
Ray G. Gibson ..... District Editor
John P. O'Donnell ..... District Editor

HOUSTON OFFICE
802 Sterling Building
Phone CApitol 4-7726

Larry Reser ..... District Editor
Ed McGhee ..... District Editor
Joe Reilly ..... District Editor

DALLAS OFFICE
1238 Mercantile Building
Phone Riverside 8-3074

Robert J. Enright ..... District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone VAndike 0722

D. H. Stormont ..... District Editor
William T. Smith ..... District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Bertram F. Linz ..... District Editor

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., Mount Pleasant, Mich., Melbourne, Australia; Regina, Sask.; Chatham, Ont.; Casper, Wyo., and Anchorage, Alaska.

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TECHNOLOGY—OPERATION

Pipelining

Pipeline Pressure-Surge Problems 112

By Robert D. Kersten and Edwin J. Waller

This is Part 1 of a two-part article dealing with the problem of pressure surges. A new approach to this old problem is given here, based on a 5-year study of surge phenomena. New principles permitting better design are now undergoing formulation. The first design applications will probably be for reciprocating pump systems.

Pipeline Patrol 155

Refining-Processing

Automatic Rating of Fractionators 103

By John C. Reidel

This report outlines the major steps in a practical program for plate-to-plate computations on a medium-speed computer. The report deals specifically with the I.B.M. deck 1.10. Humble Oil & Refining Co. has found use for this program at Baytown, particularly on the naphtha fractionation and rerun facilities of the cat reformer section. One of the modifications of this program was used just recently for the Cosden Petroleum Corp. 300-plus-plate ethyl benzene separation project.

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Drilling-Production

Factory-Built L.A.C.T. Unit is Gas Operated 98

By Ralph W. Hill

Here is the story of Pan American Petroleum Corp.'s lease-automatic-custody-transfer unit now operating in southern Oklahoma. This is a package unit whose inherent low cost may prove attractive to operators considering L.A.C.T.

New Tender Features A. C. Power 120

By Ed McGhee

A new Delta Marine Drilling Co. tender has been designed to take advantage of the benefits of a.c. drive. Eddy-current couplings are used to obtain variable speed and torque. Since it uses a.c. throughout, this Delta Marine tender has only one electrical system and one group of engines. Installed horsepower is less than would be required with any other type of drive.

Centrifuge Means Better Mud, Faster Hole, Less Labor, Lower Costs 124

By Ray W. Williams and John Mesaros

The greatest value of centrifuging is in maintaining weighted muds. The centrifuge has operated on weighted Gulf Coast muds since 1953. It salvages barite and rejects harmful native solids.

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By Dr. R. G. Hamilton and Paul Charrin

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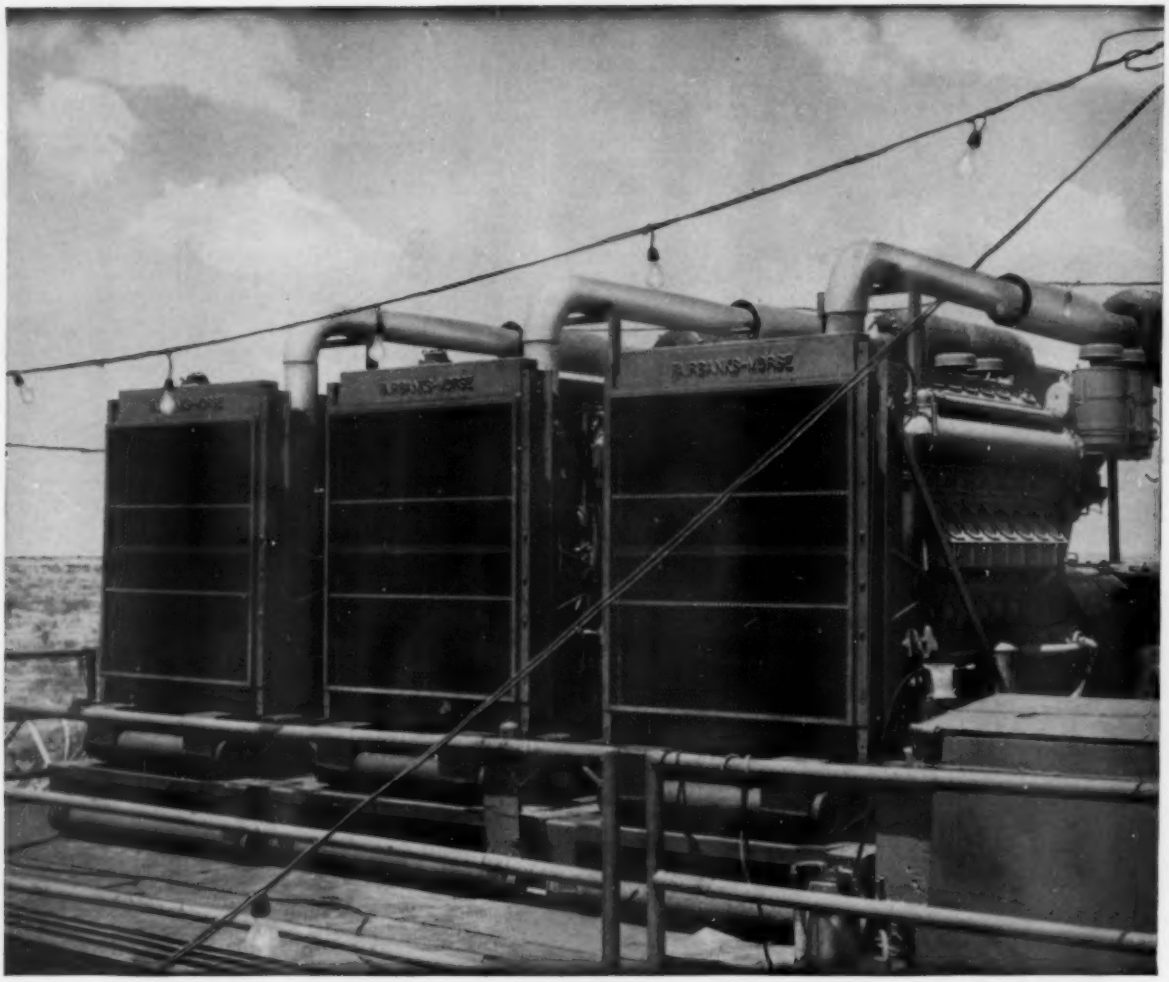

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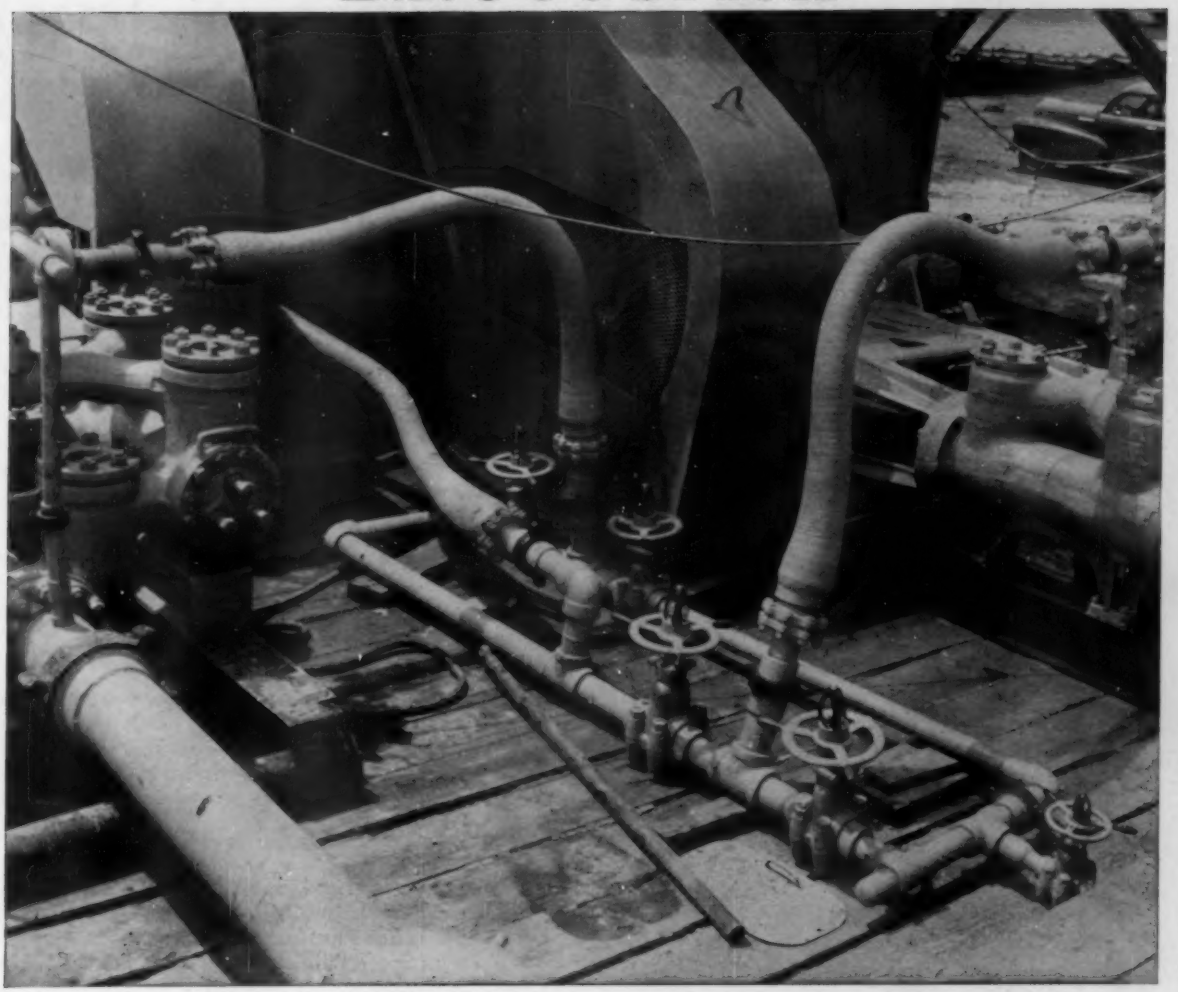

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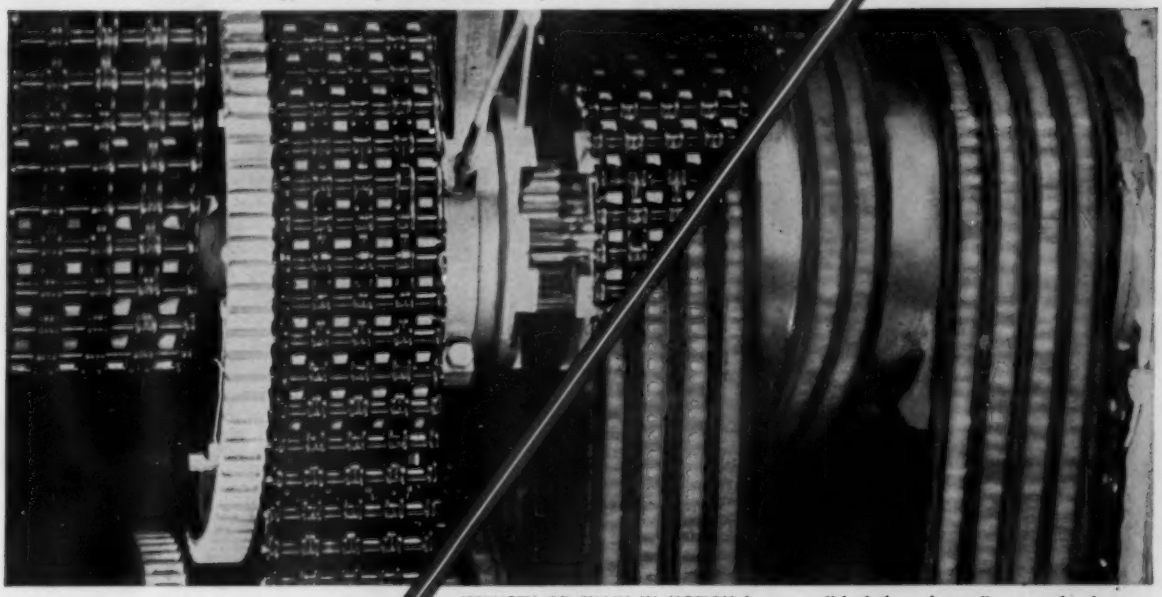

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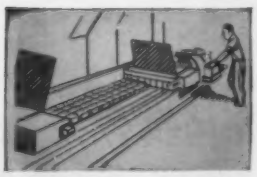
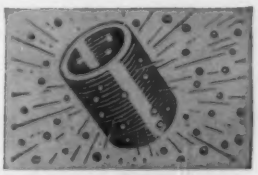
LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Shreveport, La., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 14.228

LINK-BELT gives you dynamic strength that comes from these important EXTRAS

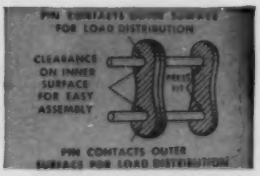


PRE-STRESSING of multiple width chain provides uniform load distribution.



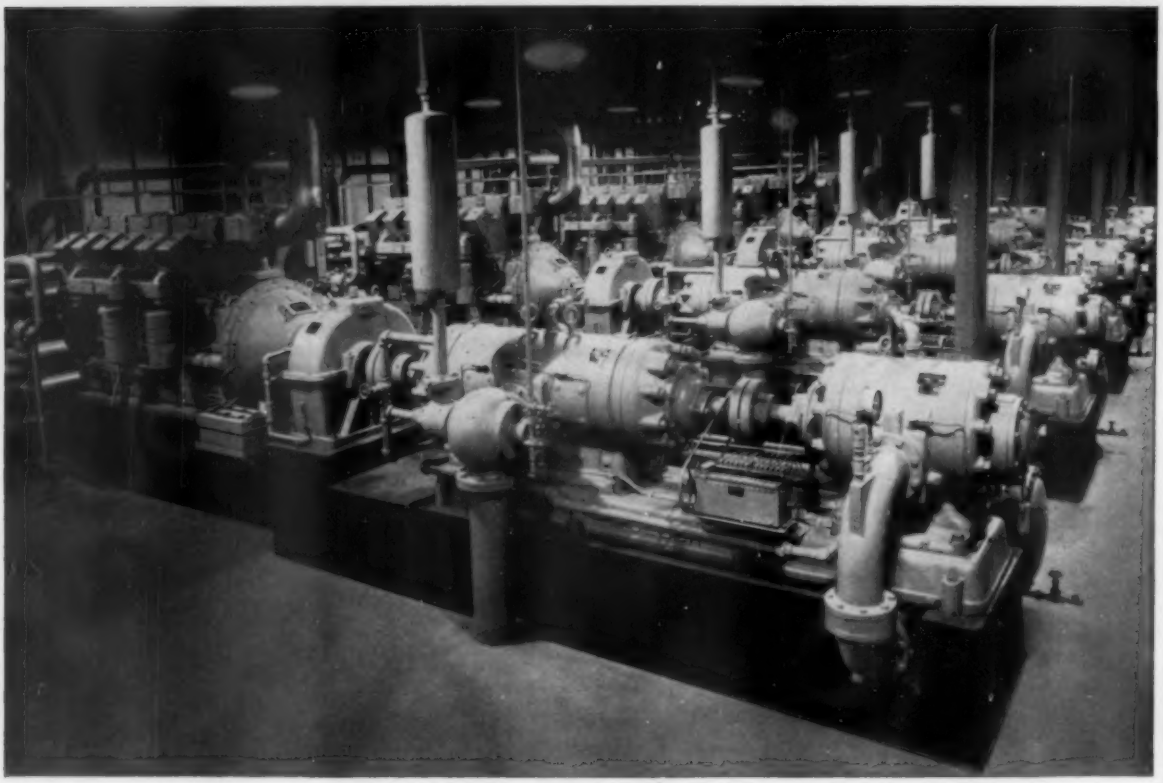
SHOT-PEENED ROLLERS have greater fatigue life, added ability to withstand impact.

SHEPHERD'S CROOK COTTERS will remain in place under severe operating conditions.



FASTER COUPLING and uncoupling of multiple width chain with E-Z Assembly feature.

LUBE OIL COOLING BY ROSS



Five Climax Engines stir up a gas hurricane

Five Climax Model V-120 natural gas engines supply the power to stir up a veritable hurricane of gas in this propane-air plant at Alameda, New Mexico. They drive rotary compressors which move almost 9 million cubic feet per day!

ON THE JOB to maintain continuous, trouble-free lubrication are Ross Exchangers. Installed by Climax as original components, they supply properly cooled oil to crankshaft, piston pin, governor and camshaft bearings...all vital parts. Long trouble-free service is assured.

IN PETROLEUM REFINERIES and pipeline compressor stations throughout the world, you'll find Ross Exchangers serving engines, compressors and practically every type of prime equipment that requires temperature control of lube oil, jacket water, hydraulic fluid and fuel oil. Combining high thermal efficiency and extreme ruggedness, they're pre-engineered, fully standardized and available in a wide range of sizes to meet your needs.

IF YOU HAVE A HAND in any equipment where heat transfer is a factor, it will pay you to learn more about Ross Exchangers. Detailed information can be obtained by requesting Bulletins 1.1K5 and 2.1K5. Write: Ross Heat Exchanger Division of American-Standard, Buffalo 5, N. Y. In Canada: American-Standard Products (Canada) Limited, Toronto 5, Ont.

ROSS HEAT EXCHANGER

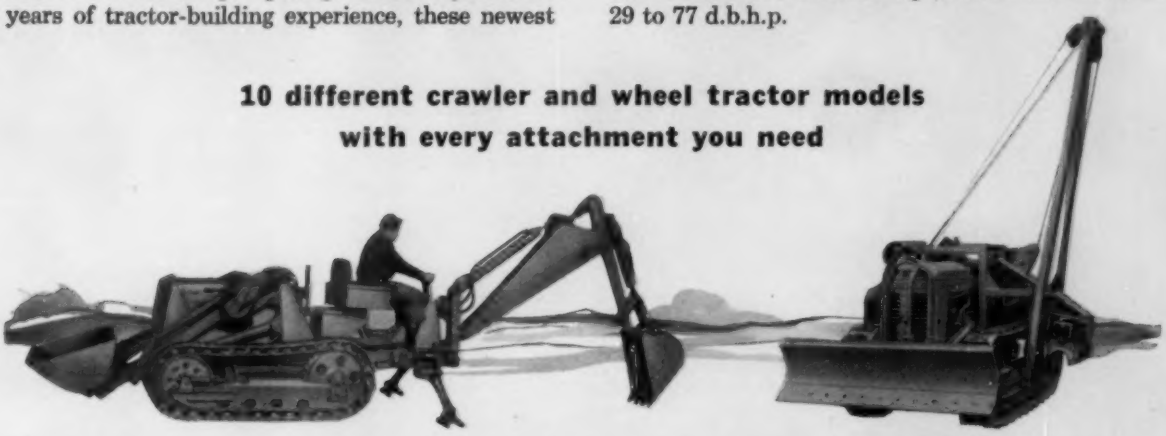
Division of AMERICAN-Standard

WHY OILMEN DEPEND UPON OLIVER

for the rugged jobs...for lowest costs

• In the oil fields, along the pipelines and in refineries all across the country these Olivers have proved that they have what it takes to get jobs done on time—and without pampering. Backed by over 50 years of tractor-building experience, these newest Olivers have the ruggedness, the versatility and the job-speeding features that put you ahead of competition on any assignment. Crawler tractors range from 21.8 to 133 drawbar h.p.; wheel tractors from 29 to 77 d.b.h.p.

10 different crawler and wheel tractor models with every attachment you need



OC-46 LOADER WITH JET-TRENCHER—21.8 drawbar h.p.; ⅝-yd. loader bucket. Jet-Trencher is mounted or removed in 90 sec.

"LITTLE BOOMER"—2000-lb. lifting-carrying capacity. Also mounts dozer, pipe bending shoes, winch, etc. Model OC-12 side boom handles 13,000 lb.

UNIVERSAL TRENCHER—digs up to 4′ deep and 18″ wide; 8 digging speeds. Hydraulic control with all features for low-cost trenching.

OC-12 WITH POWER-TURN STEERING—53 d.b.h.p.; available with dozer, angleblade, side boom and other attachments.

SUPER 88 HYDRO-TRENCHER—a fast-working ½-yd. back hoe, digs to 12′ depth. Dual hydraulic control provides smooth, efficient production. Also converts as shovel.

SUPER 55—sized for hundreds of jobs; 6 travel speeds; available with a full complement of attachments for lifting, loading, carrying, digging, etc.

Ask your Oliver distributor to demonstrate or write for literature.

THE OLIVER CORPORATION
400 West Madison Street, Chicago 6, Illinois

OLIVER

A complete line of industrial wheel and crawler tractors and matched allied equipment

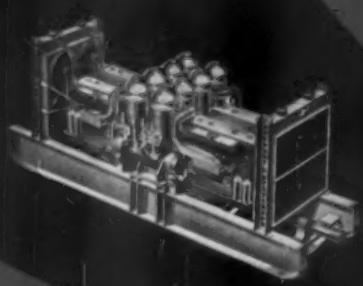
UNPARALLELED EXPERIENCE THAT'S WORLD-WIDE

STEWART & STEVENSON

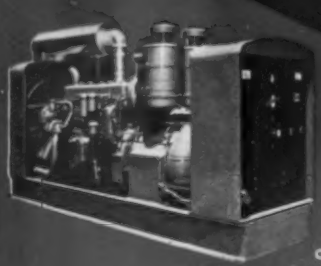
• Stewart & Stevenson Oilfield Utility Units. Diesel or Gas. Completely self-contained. Combination Rig Lighting Plant, Electric Welder, Air Compressor Unit, Wash Down Pump.

• A backlog of experience gained in making more varied industrial power applications than any other organization is your guarantee that when you deal with Stewart & Stevenson, you get the best.

• RIGELECTRIC* by Stewart & Stevenson provides power deluxe with flexibility and dependability. Multiple engine dependability, simple controls, 1000 H. P.



• Adapted and developed by Stewart & Stevenson, this new 6-110 GM Quad Unit brings industry a new concept of a compact, high horsepower package at reasonable cost. 880-1000 Continuous Horsepower.



• From the sub-zero temperatures of the Arctic to the torrid heat of the tropics, Stewart & Stevenson Generator Sets are on the job. Diesel, Gas, Butane —3KW to 1000KW.

Phone, Wire or Write for complete information on any Diesel, Gas or Butane power application.

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Export Office:	Room 1405, 74 Trinity Place, New York, N. Y. Phone Digsby 4-6658.

*"RIGELECTRIC" REGISTERED TRADE MARK FOR STEWART & STEVENSON DC DRILLING RIG POWER

THE WORLD'S LARGEST DISTRIBUTOR OF DIESEL ENGINES

For faster machinery deliveries to the Middle East, Mediterranean and South America, ship American Airlines

AIRFREIGHT

American offers direct service from more oil manufacturing supply cities than any other airline

Now oil men who need machinery or parts in a hurry can schedule deliveries via American Airfreight. This way, they benefit from the extra speed of direct service from their suppliers. American covers more oil manufacturing supply cities than any other airline with service from HOUSTON, DALLAS, TULSA, OKLAHOMA CITY, LOS ANGELES, SAN FRANCISCO, PITTSBURGH, CHICAGO, DETROIT and ST. LOUIS. In addition, American serves drilling locations anywhere in the world on a through airbill.

AMERICAN AIRLINES AIRFREIGHT

—flies more freight than any other airline in the world

YOURS TO PROFIT BY

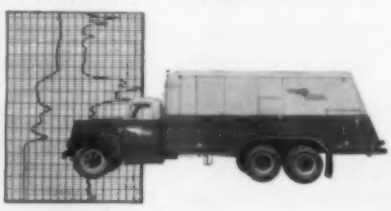
ULTRA-FI

HALLIBURTON'S EXCLUSIVE FM SYSTEM
OF NEAR-ZERO-ERROR LOG TRANSMISSION

High-priority messages about the production potential under your lease are not entrusted to outmoded direct-voltage transmission on a bundle of leakage-vulnerable wires... when Halliburton logs your well!

Instead, in electric and most other types of Halliburton logging, an "Ultra-Fidelity" self-calibrating FM transmitter rides downhole in the survey tool. It causes each continuously variable electrode voltage to frequency-modulate a carrier. Carriers are multiplexed onto a single conductor for FM transmission to receiver and recorders at surface. Errors that could otherwise result from line leakage are virtually ended.

That's Halliburton's "Ultra-Fi"... one of the great forward steps in well logging accuracy. It's yours to profit by.



HALLIBURTON

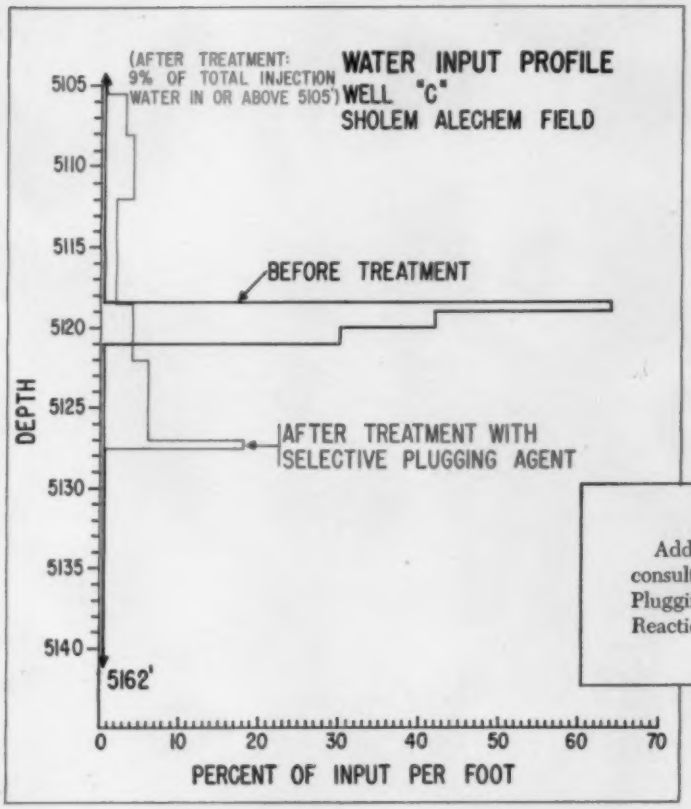
OIL WELL CEMENTING COMPANY, DUNCAN, OKLAHOMA

HOW ISOFLOW SURVEYS BY HALLIBURTON HAVE

GUIDED IMPROVEMENT OF WATER FLOODING

problem:

A well offsetting the injection well responded with fast oil production. Then injection water broke through. This meant that a water channel had developed between the input well and producing well. Theoretically recoverable oil was being left in place.



Additional information on request, or consult AIME paper #754-6, "Selective Plugging of Injection Wells by In Situ Reactions."

solution:

A Halliburton Isoflow survey showed that all of the injection water was entering 2½ feet of the section. With log records for guidance, a Halliburton crew selectively treated and plugged the well. After treatment an Isoflow survey showed that the injection water was entering in 21 feet of exposed section. Production of the offset well three days after Halliburton treatment was 174 barrels of oil and .5 barrels of water. Fifty-six days later this well was producing 120 barrels of oil. Percentage of water was still small.

ELECTRICAL WELL SERVICES

"ELECTRONIC EYES FOR OILMEN"

Put AUTOMATION into Metered product handling— from start to finish

with

BRODIE *SHOCK-FREE* QUANTROLS— fully automatic quantity control

Now every line from 2" to 8", with capacities from 100 to 1,300 gpm and working pressures up to 150 psi, can be equipped with automatic transfer and delivery control. One operator can handle several bulk transfers simultaneously. All that's required is to set the *BiRotor Quantrol* and start the meter. When preset gallonage is reached, automatic SHOCK-FREE Shutoff stops the flow without shock damage to pumps, lines and equipment. Save manhours...avoid spillage hazards and losses with Brodie SHOCK-FREE *Quantrols*. Get full details today.

703

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ALL-STEEL TRUE ROTARY

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Another Goodyear First:

V-Belts *with the* Green Seal

stay matched from factory to drive

The Green Seal signifies true dimensional stability. It means that now when you reach for a matched set of V-belts, you can be sure they're matched – no matter how long they've lain on the shelf. And that means longer life and a minimum of down time.

It used to be that only steel-cable V-belts by Goodyear were length stabilized. But now, through the miracle of Triple-Tempering, they've been joined by all the other Goodyear Industrial V-belts.

Triple-Tempering is the exclusive process wherein synthetic cord is carefully brought to the peak of strength and stability by controlled tempering with Tension, Temperature and Time. And this gives you not only *length* stability in storage, but greater shock- and stretch-resistance on the drive.

In addition to 3-T load-carrying members, the Green Seal also brings you "balanced construction." This means each component of the belt is specifically designed to its job to give you cleaner, smoother, longer running which adds up to maximum, trouble-free horsepower hours at minimum cost.

The next time you need V-belts, be sure they're wearing the Green Seal–the mark of a V-belt made with the technical know-how of the world's largest rubber company. They're readily available at your Goodyear Distributor. Or write for details to Goodyear, Industrial Products Division, Lincoln 2, Nebraska, or Akron 16, Ohio.

DIMENSIONALLY STABLE V-BELTS by

GOODYEAR

THE GREATEST NAME IN RUBBER

Green Seal—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

FOXBORO
TYPE 12 A
TEMPERATURE TRANSMITTER
SER.
ADJUSTED RANGE
15 PSI =
3 PSI =
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Rugged, Versatile Temperature Transmitter Improves Remote Control

. the Foxboro M/12A (pneumatic)

There is no easier, simpler way to measure remote temperatures, *fast*, over so wide a range, with such high sustained accuracy, and at so low a cost!

Between the limits of —100°F. and +1000°F., with operational spans of 50°, 100°, 200°, and 400°F, this rugged, highly responsive instrument performs outstandingly under the most severe conditions. It is compensated for ambient temperatures and pressure. Derivative action can be furnished for optimum performance when substantial thermal or transmission lags exist.

With its weatherproof housing and integral mounting bracket, it can be installed in any hazardous, corrosive, or outdoor location. Transmission lines are standard copper tubing, no electrical hazard, no costly capillary to run.

Write for Bulletin 13-17. It explains fully why the Foxboro M/12A Temperature Transmitter gives better performance with lower installation and maintenance cost. **The Foxboro Company, 605 Neponset Ave., Foxboro, Mass., U.S.A.**

FACTORIES IN THE UNITED STATES, CANADA AND ENGLAND

• Pneumatic Temperature Transmission

on the "scorpion"...

the Rotary Hose is

Thermoid

POWERFLEX

The patented full flow coupling at the left is just one reason why the Scorpion is equipped with Thermoid Powerflex Rotary Hose. It's an integral part of the cable assembly—cannot leak or pull off. The cable itself is made up of *33 miles of high tensile steel-wire* wrapped and counter wrapped. And the tube and cover of Powerflex Hose are made with oil and abrasion resistant Neoprene, reinforced with impregnated multi-ply woven fabric.

You'll also find Thermoid Suction and Discharge Hose and Thermoid Multi-V Belts "aboard" the Scorpion for the same reason—superior quality construction. Order Thermoid Oil Field Products from your nearest supply store or Thermoid warehouse.

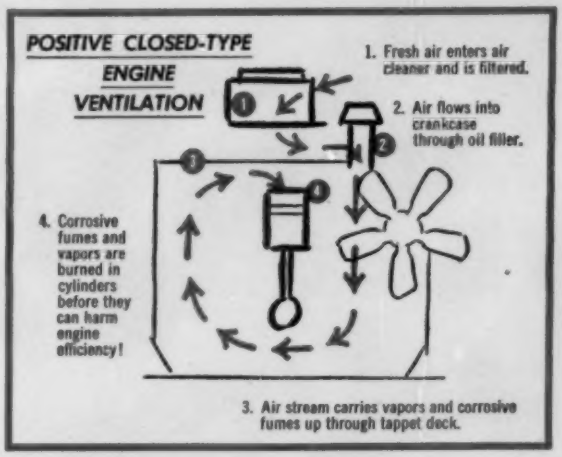
Thermoid

THERMOID COMPANY, TRENTON, NEW JERSEY, NEPHI, UTAH
Warehouses: **HOUSTON, OKLAHOMA CITY, ST. LOUIS, CASPER, LOS ANGELES**

"CLEAN LIVING" GIVES A CHEVY ENGINE LONGER LIFE!

. . . more evidence that Chevrolet Task-Force trucks are engineered better and built better for bigger savings!

This drawing shows, roughly, one of the ways in which Chevrolet truck engines minimize a major cause of wear—dirt! Now consider this additional evidence that Chevy heavy-duty V8's and 6's "live clean" and bring you fleet, dependable power that costs less to use!


POSITIVE CLOSED-TYPE ENGINE VENTILATION
1. Fresh air enters air cleaner and is filtered.
2. Air flows into crankcase through oil filler.
3. Air stream carries vapors and corrosive fumes up through tappet deck.
4. Corrosive fumes and vapors are burned in cylinders before they can harm engine efficiency!

Extra filters give extra-clean fuel—Only *clean* fuel reaches the engine—that's one reason you can depend on a Chevrolet truck! All fuel is filtered twice (once in the fuel tank and again in the carburetor) to keep dirt and water from hampering efficient operation. Chevrolet truck V8's provide a *third* filter, at the carburetor, for triple protection!

Oil stays clean longer, too—Chevrolet truck V8's and 261-cu.-in. 6's come equipped with modern high-capacity oil filters (V8 filters are of the Full-Flow type). These engines keep *clean* oil flowing to moving parts; parts wear less and last longer because of it!

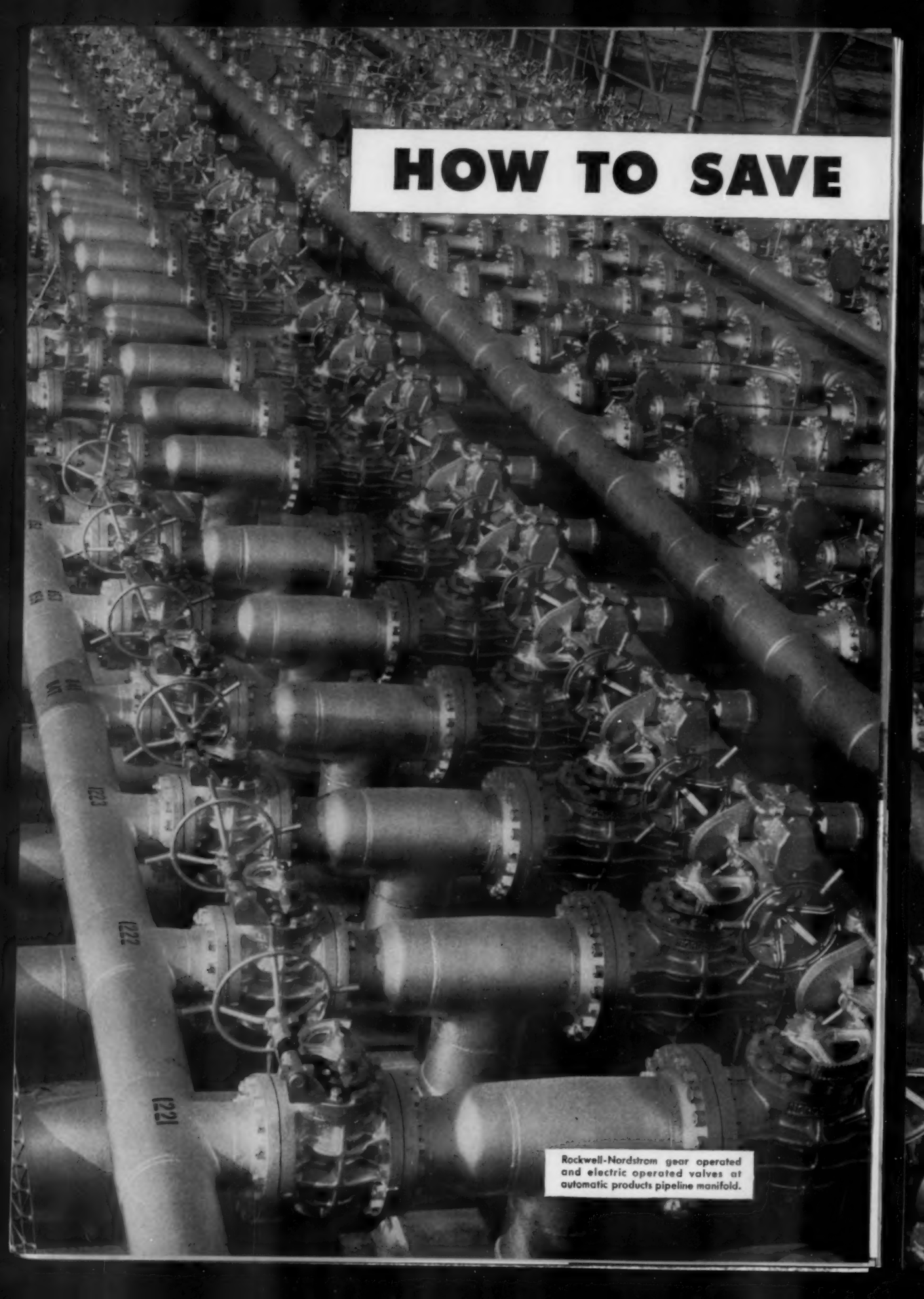
Even the air is cleaner—Dust and foreign matter in the air an engine "breathes" can reduce engine life by years. Chevrolet minimizes this wear-producing factor by providing big oil-bath air cleaners as *standard equipment* on all truck engines.

These are sound under-the-hood reasons why a Chevrolet truck will *stay* on your job and *save* on your job. There are others, too, including short-stroke V8 design (shortest stroke of any truck V8's!) and 6-cylinder engine design that puts out more power than any other in the field. You'll learn about them all when you visit your Chevrolet dealer. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

Biggest sellers . . . because they're biggest savers!

CHEVROLET TASK·FORCE 57 TRUCKS

HOW TO SAVE



Rockwell-Nordstrom gear operated and electric operated valves at automatic products pipeline manifold.

MONEY ON MANIFOLDS

...and get better flow control

One lone valve that leaks or causes maintenance problems may not be too noticeable. But a pipeline manifold with *hundreds* of valves is a different matter. That's why you so often see huge manifolds (like the one at the left) 100% equipped with Rockwell-Nordstrom lubricated plug valves. Here's why they will save you money and assure better flow control year after year:

Lower Maintenance: Lubrication is preventive maintenance against repair and replacement . . . trouble doesn't have a chance to start. Also, the seats are *never* exposed to the line.

Longer Life: Lubrication prevents the grinding wear of metal-to-metal friction that ruins ordinary valves so quickly.

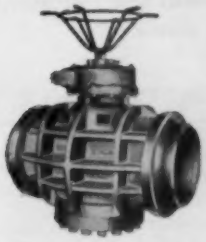
Positive Shut-Off: Costly product loss and contamination are eliminated because pressurized lubricant forms a tough, instantly replaceable seal that can't "wear out."

Compact Design: There are no bonnet cavities or rising stems. They can be manifolded much tighter . . . cuts investment in pipe, flanges, fittings, etc.

Rockwell-Nordstrom lubricated plug valves are available in a complete range of sizes and pressure ratings to meet your every pipeline need. They can be supplied with electric, hydraulic or pneumatic motor operators for automatic and remote operation. And they cost no more to buy—often less—than ordinary valves. See your supplier or write Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Canadian Valve Licensee:* Peacock Brothers Limited.

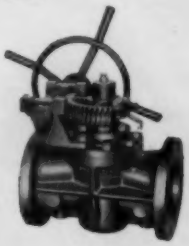
ROCKWELL-Nordstrom VALVES

Lubricant Sealed For Positive Shut-Off



Rockwell-Nordstrom Hypreseal valves for pressures to 10,000-lb WOG and in sizes to 30" by 34".

Rockwell-Nordstrom Multiport 3-way valves for pressures to ASA 1,500-lb WOG and in sizes to 16".



Rockwell-Nordstrom Standard valves for pressures to ASA 600-lb and in sizes to 30".

Why Our Customers Fit ROCKWELL-Nordstrom VALVES Into Their Operations...

ROCKWELL-Nordstrom valves have proved best for permanent installations because they are lubricant sealed for really positive shut-off.

Mid-Continent Customers prefer valves with design simplicity because fewer parts mean fewer repairs. ROCKWELL-Nordstrom valves, proven through 40 years of service in the industry, are built for longer life at low end cost. The original lubricated plug valve has features that have never been equaled . . . Positive Quarter-Turn Rotary Action . . . Unexposed Seats Eliminating Corrosion and Erosion . . . Ports Surrounded by Sealing Lubricant Film . . . Repackable under Pressure . . . These and many other reasons are why our customers call for ROCKWELL-Nordstrom valves. Contact your Mid-Continent representative for valves in complete sizes and pressure ratings. Mid-Continent stores, sales offices and representatives are located in all oil active areas.

Another Field-Proved Product Supplied by Mid-Continent

PESA PARTNERS IN PETROLEUM PROGRESS

MID-CONTINENT Supply Company

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Export Division: 45 Rockefeller Plaza, New York 20, N. Y. Cable: MIDCUMPORT NYK

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

110°

in the shade ...and NO shade... but

Vornado® cools the car!

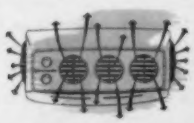
Start Cool... Drive Cool... Arrive Cool!

Here's the only *really dependable* way to beat the discomfort of hot, windy, dust-filled days in the field! Vornado—first national brand name in automobile air conditioning—brings you amazing new engineering principles for the greatest cooling effect ever! Compact under-the-dash installation provides ample passenger leg room and equipment-carrying capacity.

WHEN YOU START YOUR CAR... Vornado STARTS TO COOL!

Instant cooling action cools your entire car in moments ... assures relaxing comfort from the word "go"!

TOP EFFICIENCY AT ANY SPEED
From idling speeds to top turnpike speeds, Vornado operates at top efficiency. Simple thermostat regulates cooling comfort constantly. Three-speed blower control governs air delivery—as you like it!



GREATER COOLING EFFECT... because only Vornado has FIVE air circulators to surge vast quantities of cool air throughout the entire car! Each circulator is individually adjustable.

SIMPLIFIED INSTALLATION... takes only a matter of hours! And, Vornado is interchangeable to your next car!

DEPENDABLE NATIONWIDE SALES AND SERVICE

Wherever you travel, you'll find reputable, trained Vornado installation and maintenance service! Backed by the famous Vornado Warranty.

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World's Leading Manufacturer of Comfort Cooling Appliances
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MORE HORSEPOWER PER POUND — Provides greater volumes and pressures per pound than any other slush pump.

EXCEPTIONAL PERFORMANCE — Advanced design, superior engineering and precision manufacture guarantee exceptional performance.

COMPACT DESIGN — Compact, lightweight design and construction make moving easy.

"EXPOSED" LINERS — The famous, exclusive Continental-Emsco "exposed" liner design minimizes fluid end "washouts" caused by liner failure.

EASY, SIMPLE MAINTENANCE — There are no adjustments to be made—no greasing to be done—lubrication is completely automatic.

A SIZE FOR EVERY JOB — Six sizes are available for any type of mud pumping job—for shallow, medium or deep drilling, for jet bit or deep hole.

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are an important part of the drilling team!

Around the globe – around the clock you'll find Continental-Emsco Slush Pumps working in oil fields everywhere, pumping more mud with less cost. For latest bulletins and engineering data, write today.

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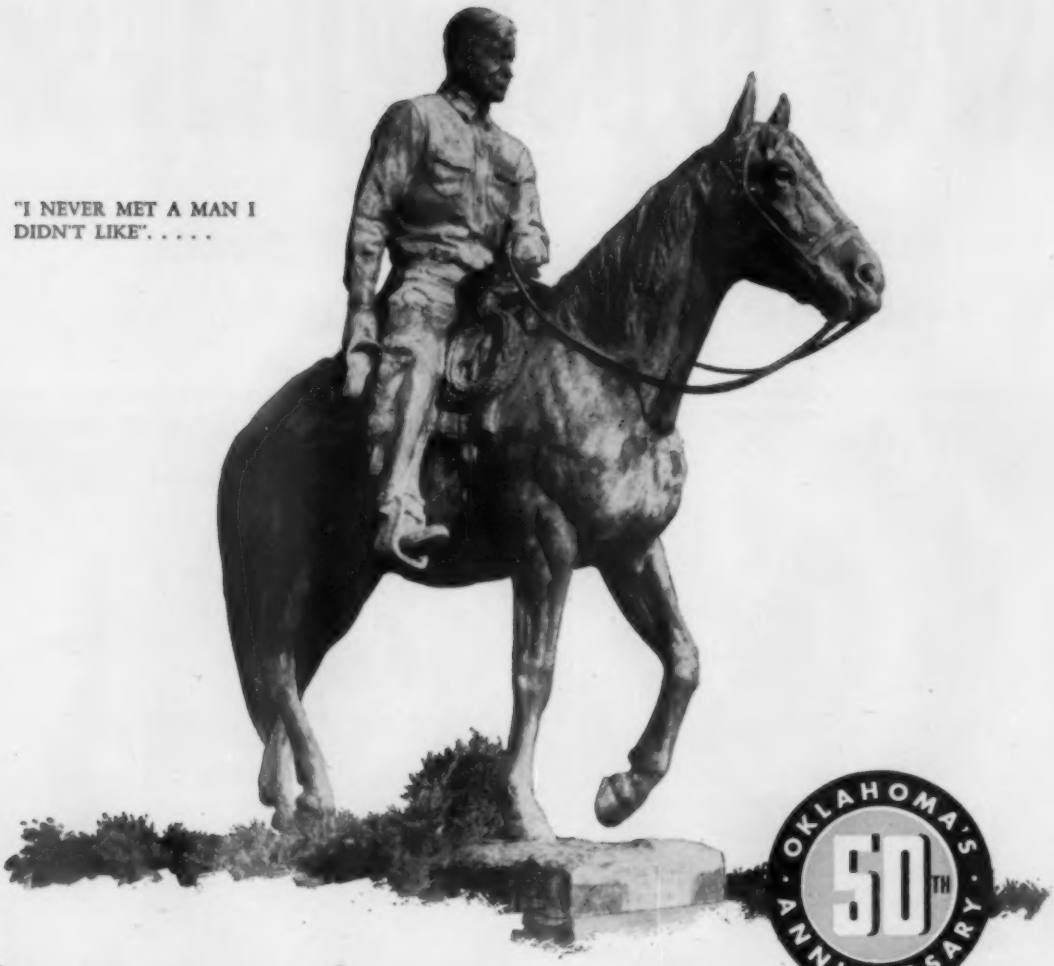
Representatives in All Principal Oil Fields of the World.

SP-701

"I NEVER MET A MAN I DIDN'T LIKE". . . . .



vacation
IN OKLAHOMA...

The welcome mat is out for visitors to Oklahoma during her Semi-Centennial celebration. Stop at the Will Rogers Memorial in Claremore where, next to Mt. Vernon, more visitors, annually, pay their respects than at any other national Shrine. Enjoy the natural wonders from the Kiamichis to the Panhandle . . . from Grand Lake to the Wichitas . . . explore her 14 state parks . . her fantastic man-made lakes . . . her colorful Indian festivals . . . her museums and memorials and her famous oil fields! You'll "like" what you see in Oklahoma.

And Oil men like the oil department of the Oil Bank of America which we invite you to use.

Photo of Will Rogers Memorial

NATIONAL BANK OF TULSA
THE OIL BANK OF AMERICA
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

U-501
106 hp @ 1800 rpm

U-450
92.8 hp @ 1800 rpm

U-372
76.8 hp @ 1800 rpm

IO sure ways to get

U-308
68 hp @ 1800 rp

U-264-6
57.5 hp @ 1800 rpm

U-220
49 hp @ 1800 rpm

more usable pump power

U-281
65.5 hp @ 1800 rpm

U-175
43.3 hp @ 1800 rpm

U-123
22.3 hp @ 1800 rpm

U-1
10.5 hp @ 1800 rpm

...INTERNATIONALS!

Now, these 10 new and increased horsepower International oil field engines give you a bigger than ever bargain in usable pumping power per dollar. Ranging from 10.5 to 106 hp at 1800 rpm continuous duty speed on natural gas, these International power units all give you the most dependable power at the lowest cost for the longest time.

Check this feature list and you'll see why: efficient valve-in-head design; long life full-pressure lubrication; positive crankcase ventilation; fuel-saving combustion chambers; replaceable precision bearings; up-draft carburetor and top outlet exhaust; replaceable oil filter element; and in-built rifle-drilled lubrication passages.

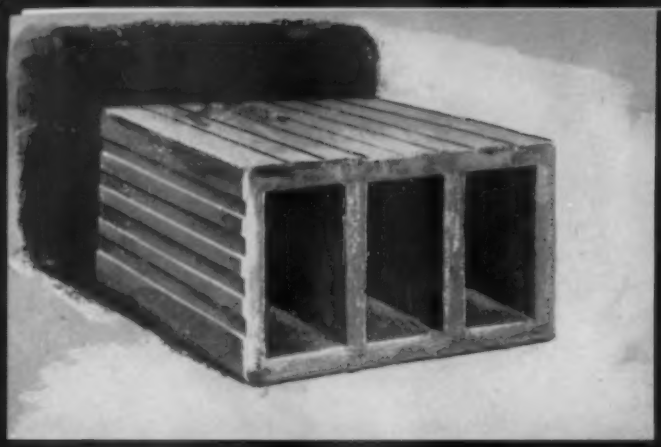
Cut your pumping costs two ways: specify International power on your new equipment; or call in your nearby International Power Unit Distributor or Dealer when it's time to repower. He'll give you a money-saving power recommendation that fits your needs. And you'll find he can be counted on for prompt service and the parts you need when you need them most.

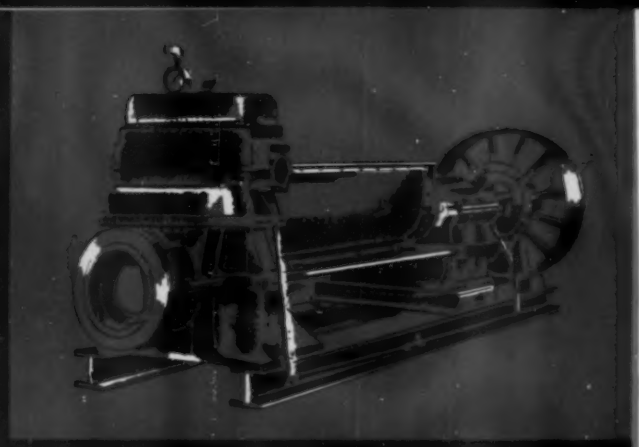
INTERNATIONAL®

International Harvester Company
180 North Michigan Ave., Chicago 1, Ill.

CONSTRUCTION EQUIPMENT

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors ... Self-Propelled Scrapers ... Crawler and Rubber-Tired Loaders ... Off-Highway Haulers ... Diesel and Carbureted Engines ... Motor Trucks ... Farm Tractors and Equipment.





No Margin for Air— No Margin for Error

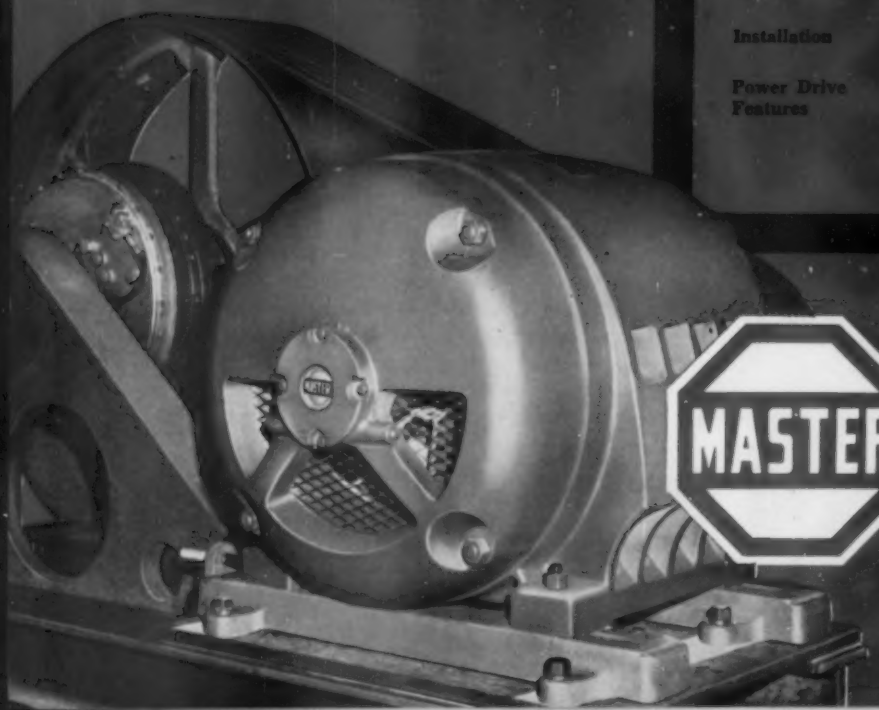
ANOTHER DRIVE REQUIREMENT MEETS ITS MASTER

Yes, it's a fact—unless you remove the air from the clay, you get a no-good tile. And whether air is your problem, or not—error is always a problem. And it's never a mistake to come to Master for the right power drive. In every kind of industry, Master customized package drives give you the utmost in flexibility, compactness and performance.

Here, the primary requirement is power—and the husky, big 200 H.P. Master fills the bill year in and year out. Your requirements might be better met by integrating Master components into a single, efficient, compact unit for the right horsepower, right shaft speed and right mounting features. What are they?

A husky 200 H.P., 440 volt squirrel cage induction Master Motor powers this 14-ton De-Airing Brick and Tile Machine with a capacity of over 8000 bricks per hour. Two parallel shafts carrying pug knives work clay, pass it into vacuum chamber with auger cylinders where it is finished and discharged.

Motor Ratings	⅛ to 400 H.P. All phases, voltages and frequencies.
Motor Types	Squirrel cage, slip ring, synchronous, repulsion-start induction, capacitor, direct current.
Construction	Open, enclosed, splashproof, fan-cooled, explosion-proof, special purpose.
Speeds	Single-speed, multi-speed, and variable speed.
Installation	Horizontal and vertical, with or without flanges and other features.
Power Drive Features	Electric brakes (2 types)—5 types of gear reduction up to 41⅔ to 1 ratio. Mechanical and electronic variable speed units—fluid drives—every type of mounting.



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THE MASTER ELECTRIC COMPANY
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Butler metal building 32 feet by 48 feet used for a pumping station in Houston, Texas.

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Butler building used by an oil field drilling company in Pratt, Kansas. Note cement block sidewalls near the office area in front.

For more information on this economical building that is a "natural" for the gas and oil industry, phone your Butler Builder. His name is listed under "Buildings" in the yellow pages of your telephone directory. Or write direct for brochure, "Butler Steel Buildings for the Oil Industry."

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Irregular fittings on small pipes of mixed diameters are easily wrapped with the proper widths of "SCOTCHRAP." This smooth, tough tape conforms tightly to elbows, flanges, and welded beads, as well as long lengths in all diameters. Pressure-sensitive "SCOTCHRAP" is super-strong polyvinyl chloride plastic tape in rolls. Available in seven standard widths from 1 to 18 inches. "*The quality pipe protection that rolls on dry.*"

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SCOTCHRAP

BRAND

PIPE INSULATION

Look what you can do with "SCOTCHRAP"!

54-INCH circulating water lines are easily protected against corrosion by wrapping with wide-width "SCOTCHRAP." Tape is clean, easy, safe to use; no heat or special equipment necessary.

QUICK, easy application of "SCOTCHRAP" to long lines of welded pipe expedited by use of Betzel "Tapester." Permits continuous insulating with smooth, tight result.

TOUGH "SCOTCHRAP" easily withstands abrasions of rough fill. In event of tearing or accidental rupture, simple patch repairs the damage. For further information, write 3M Co., St. Paul 6, Minn., Dept. EU-57.

The term "SCOTCHRAP" is a registered trademark of Minnesota Mining and Manufacturing Co., St. Paul 6, Minn. Export Sales Office: 99 Park Ave., New York 16, N.Y. In Canada: P.O. Box 757, London, Ontario.

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CAMERON AROUND-THE -COMPASS

If you are not already one of Cameron's customers, call, cable, write or visit our Houston plant—you will find the same warm welcome, the same interest in your safety and success that has been a Cameron trademark for 37 years.

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ONE-TON TEST proves physical strength of "Integrated" field coils in ALLIS-CHALMERS MOTORS

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Coils are surface sealed against atmospheric contaminants. In addition, the coefficient of expansion of insulation is similar to that of copper. Heat transfer qualities are excellent. "Integrated" coil structures can withstand the most severe thermal cycling found in normal operation.

Exclusive Allis-Chalmers

"Double-protection," combining new "Integrated" field coils with *Silco-Flex* all-silicone stator coil insulation, is available for rotating and stationary elements of large ac or dc machines with operating temperatures through Class B range.

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Silco-Flex is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-5276

OIC VALVES

MOST COMPLETE MODERN LINE . . .

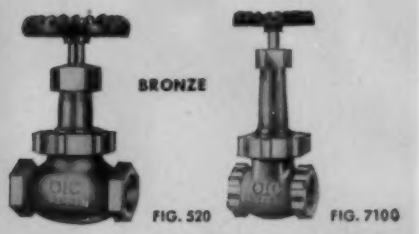

FIG. 520 FIG. 7100

Featuring union type, body-bonnet joint. ⅛" to 3". 125, 150, 200, 300 and 350 WSP; 200 to 2,500 WOG.

DURABLE AND SAFE . . .

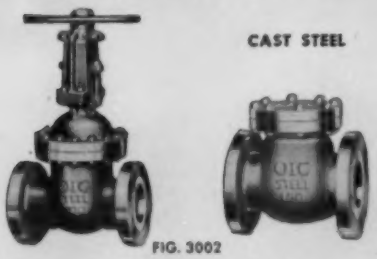

FIG. 3002 FIG. 1572

Excellent for higher temperatures and pressures. 2" to 16". 150, 300 and 600 lb. primary pressure series.

29 TYPES, 9 TRIM VARIATIONS . . .

FIG. 1140 FIG. 124 FIG. 333

Includes end-seated seat rings for streamlined flow and longer service. 1¼" to 16". 125, 150 and 250 WSP; 175, 200, 400 and 500 WOG. ¼" to 4" U-Bolt gates.

1000 BRINELL DURACASE TRIM . . .

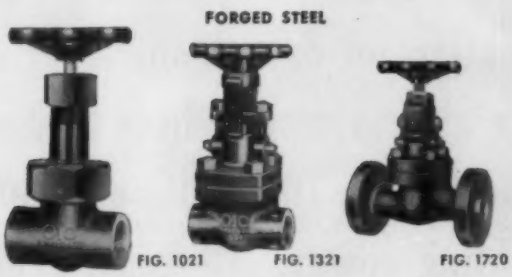

FIG. 1021 FIG. 1321 FIG. 1720

Extra-hard, duracase trim, plus your choice of bolted or union type, body-bonnet joint. ¼" to 2" gate, globe, angle, check; 600 lb. primary pressure series.

TRIPLE-SEALED AGAINST LEAKS . . .

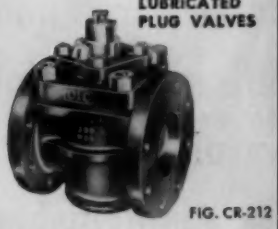

FIG. CR-212

Exclusive design ends shank leakage, holds adjustment, reduces maintenance. ½" to 12". Iron, 175 psi to 800 psi working pressures. Cast steel, ASA 150 lb. and 300 lb. pressure classes.

Write for the OIC valve cross reference booklet. It compares valves of 15 manufacturers. Request also new specification literature on the valve lines of your choice.

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A
B
C
D
A Nozzle redesigned for more uniform fire coverage, faster fire put-outs.
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PLUS FIFTY B dry chemical gives improved performance over a wider temperature range
30C
20C
10B
ANSUL

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ANSUL

The Ansul Chemical Co., Marinette, Wisconsin

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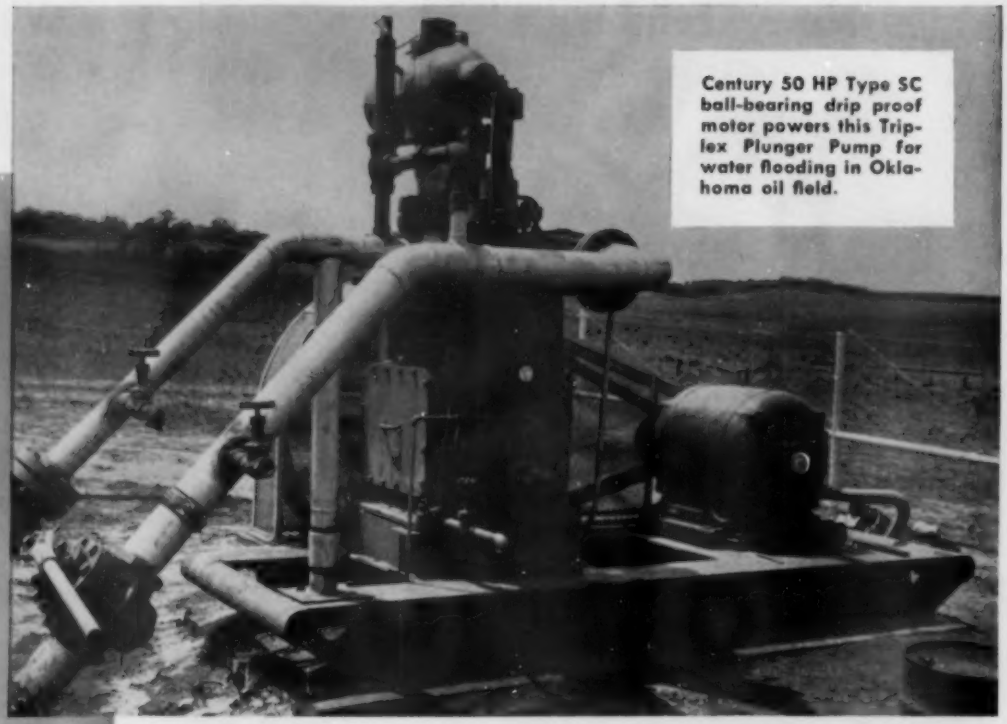
Progress in the West means...

food production must increase 35% to feed the 26½ million people who'll live here by 1965

**One of many ORTHO PLANT FOODS, made and sold by Standard's wholly-owned subsidiary, California Spray-Chemical Corp.*

STANDARD OIL COMPANY OF CALIFORNIA

puts petroleum progress to work for you



Century 50 HP Type SC ball-bearing drip proof motor powers this Triplex Plunger Pump for water flooding in Oklahoma oil field.

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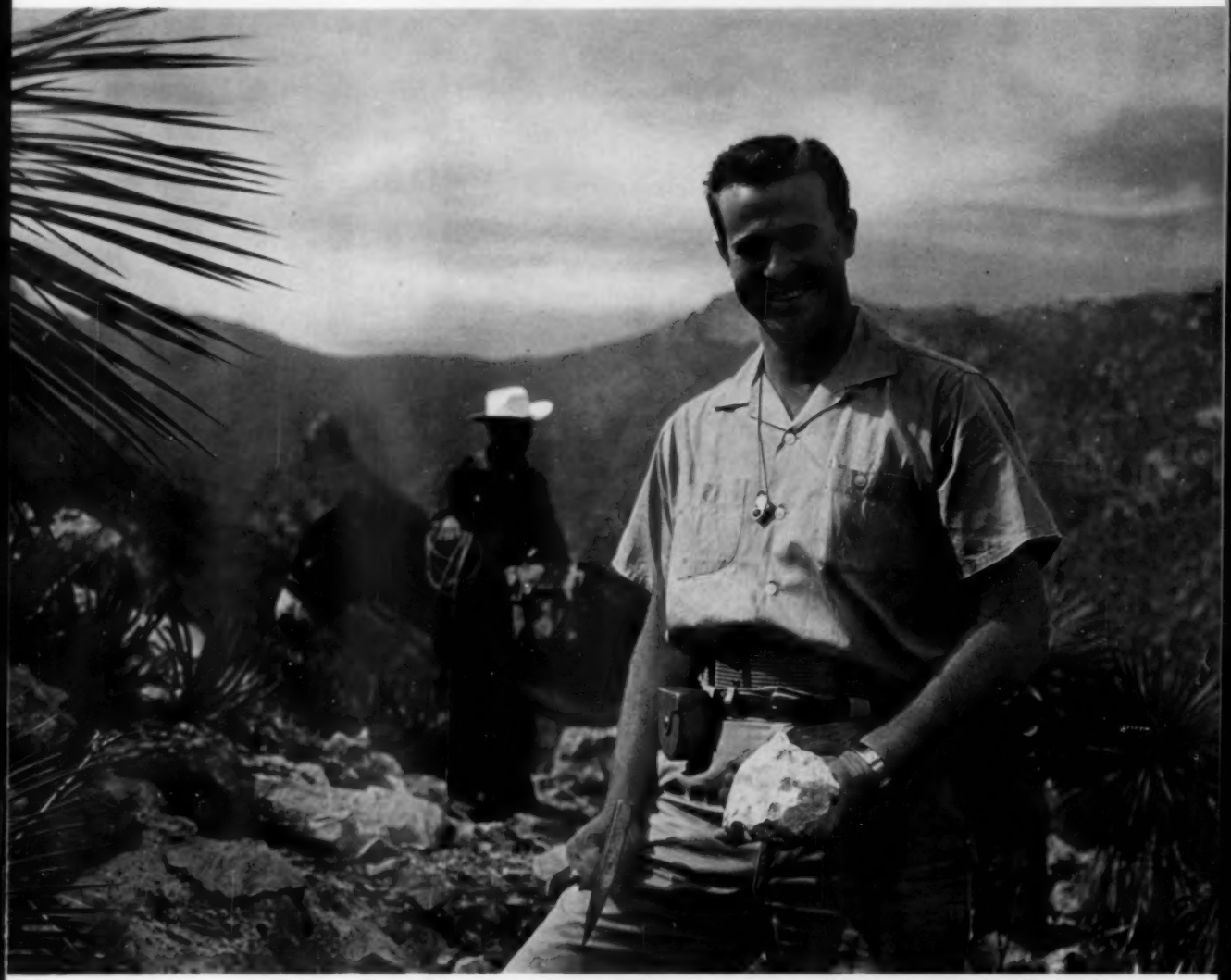
It takes a complete team to keep dependable drilling mud available for you



Meet this Magcobar Man, the geologist . . . he explores the world—and "moves mountains" to bring you drilling muds

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The Geologist is a vital part of the Magcobar team—the team that brings you the most complete mud service everywhere.

Magcobar
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DRILLING MUD SERVICE

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5 stories deep...

KERMAC RIG 46 Basically a series of pressure tubes built to ride out the toughest hurricane, the Kermac Rig 46, built by INGALLS for Kerr-McGee Oil Industries, Inc., is capable of drilling 6 wells without relocating in water up to 70 feet deep. Taller than a 10-story building and two-thirds the size of a city block, the Kermac 46 is the largest submersible drilling platform ever to go to sea. It is designed to carry the search for precious oil farther offshore than ever before.

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Fourth in a series of offshore rigs INGALLS has built for Kerr-McGee, the Kermac 46 demonstrates a radically new concept in offshore rig construction. For an economical answer to your offshore drilling problems, consult INGALLS, specialists in the field.

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INGALLS also specializes in the construction of offshore supply vessels. Service ships, such as this one built by INGALLS for the Gulf Oil Corporation, are capable of transporting 3,500 barrels of water — or two heavy stacks of 8" drill pipe — *in addition* to 2,000 gallons of drinking water and miscellaneous stores. With a pair of 516 h.p. Buda diesel engines, they can maintain a speed of 11 knots. These vessels are the lifeline of your offshore drilling rigs. With INGALLS you may be sure you have the most practical and economical obtainable.

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we can show you the forest

because of the trees

Many times oil men feel they are in a poor position financially simply because they can't see the entire picture of their operations. Caught in the complexities of their day-to-day activities, they are unable to survey their properties in a realistic, objective manner. And as a result, many times they end up working for their creditors.

Increased operating costs spell falling profits. And that means trouble. While there is no short cut way out of this problem, The Commerce working with your legal and tax counsel can many times show you how to increase profit by reducing costs. Tighter managerial control, an analysis of costs, and recommendations for changes have increased the profit of other oil men. If your problems are similar, come to the bank that actually does know the oil business and that can help you.

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(Dow technician's background of experience aids ethanolamine users)

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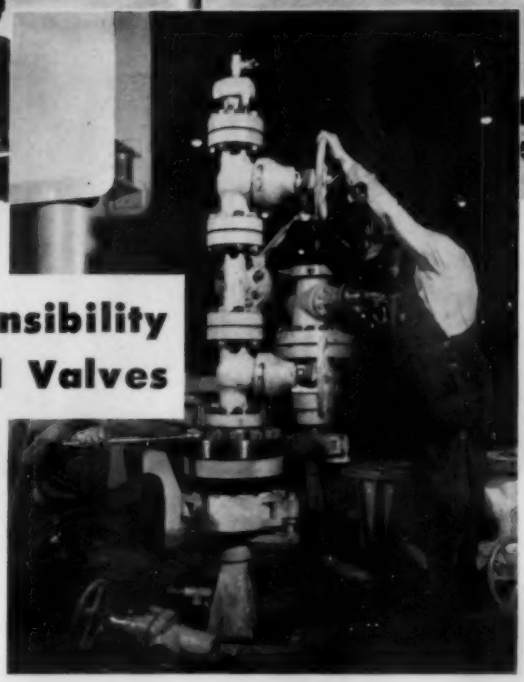

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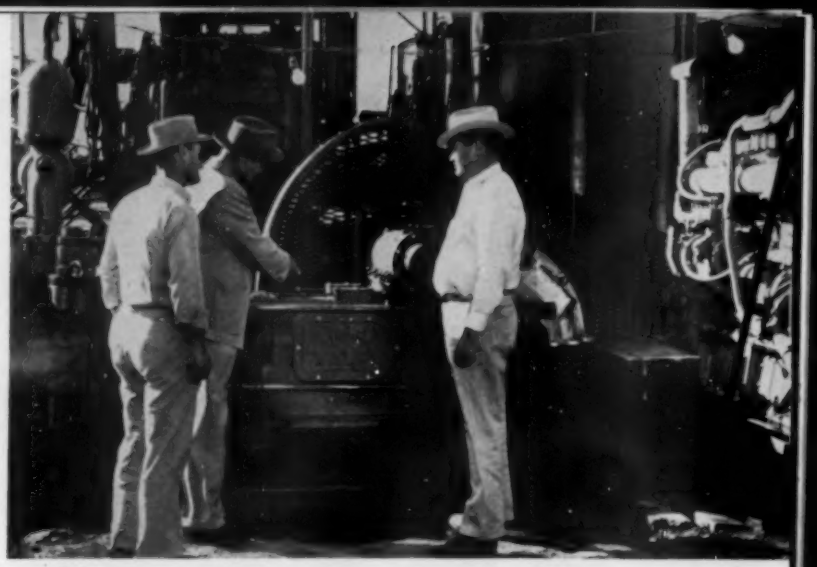
In 11 months' continuous operation, no down time and no expense on this Dependable Wheland HP-8000 Pump !

Installation view of the Wheland HP-8000 owned by Virgil Taylor Drilling Co., Gainesville, Texas. Left to right: Mr. Woody Atkins, Tool Pusher; Mr. Virgil Taylor; Mr. Walter Smith, Drilling Supt.



WHELAND HP-8000
DUPLEX SLUSH PUMP
7¼" x 12"
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WALTER L. SMITH
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VIRGIL TAYLOR DRILLING COMPANY
POSTOFFICE BOX 10
GAINESVILLE, TEXAS

November 15, 1956

Mr. Gordon P. Street, President
The Wheland Company
Chattanooga, Tennessee

Dear Mr. Street:

We purchased a Wheland HP-8000 Pump last January which has been in continuous operation since that time. We have been digging wells from 3,500 to 5,000 feet and have been running this pump within 10% of its efficiency during this work. We have had no down time and no expense against this pump during this time.

We had one of your old-style HP-11000 Wheland pumps in operation for a period of seven years. It is surprising to realize the amount of hole that it did with very small expense. We are happy to recommend the Wheland pump.

We operate two rigs in North and West Texas and in Southern Oklahoma, digging wells from 2,000 to 8,500 feet. We do contract drilling, take interest deals and drill for our own account.

Yours very truly,

VIRGIL TAYLOR DRILLING COMPANY

By Virgil Taylor

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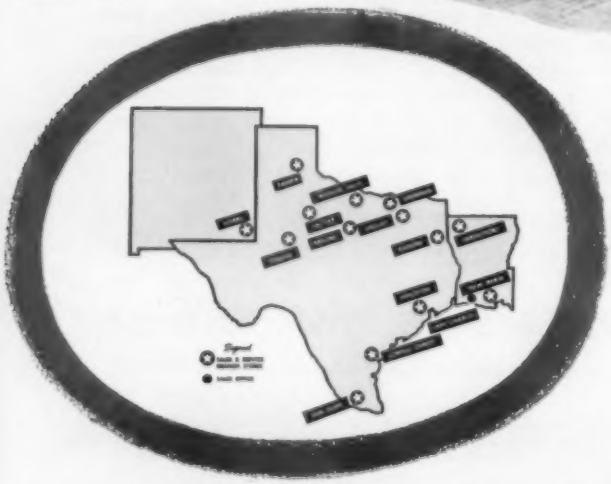
. . . the Waukesha Sales & Service, Inc., emblem on the uniform of the man from whom you buy your parts and on the truck that delivers them.

Your Waukesha engine will give its best performance only when fitted with genuine Waukesha parts. So always look for the Waukesha Sales & Service, Inc., emblem when you purchase replacement parts. Waukesha Sales & Service, Inc., branches and sales points, located throughout the oil country, carry complete stocks of engine parts, made to fit your engine and made to last, giving you the best possible performance from your Waukesha engine. So, remember the Waukesha Sales & Service, Inc., emblem the next time your engine needs a new part.



WAUKESHA

Sales & Service, Inc.

1422 MAURY ST. • HOUSTON, TEXAS

EXCLUSIVE DISTRIBUTORS FOR WAUKESHA PRODUCTS IN TEXAS, NORTH AND WESTERN LOUISIANA, SOUTHERN ARKANSAS AND NEW MEXICO

WORLD'S LARGEST DISTRIBUTOR OF OIL FIELD ENGINES

Steelcote

EPO-LUX ZINC RICH ZINC DUST PRIMER

CATHODIC ACTION

Now for the first time corrosion engineers can employ the most effective of all rust inhibitive metals in a chemical combination to achieve: (1) The cathodic protection of galvanizing at approximately ⅓ the cost of hot sprayed zinc. (2) Adhesion and flexibility which permit overcoats of maximum density, imperviousness, and resistance to moisture, acids, alkalis, and solvents. This combination of Steelcote EPO-LUX ZINC RICH ZINC DUST PRIMER, EPO-LUX 100, and Steelcote epoxy resins in many other forms as needed offer the most effective, longest-lasting protection against corrosion it is possible to obtain with on site cold applied coatings.

INVITATION TO CORROSION ENGINEERS

For test application materials or for special engineering consultation, write Dept. 23 describing your problem. Jobbers in principal cities.

Steelcote

CORROSION FIGHTERS

EPO-LUX 100

When acids, alkalis, salts or solvents are present, EPO-LUX 100 out-performs all other organic type coatings.

HALTS-RUST

Applies over rusted metal. Most used type rust control coating made for normal exposures.

STOPS-RUST

PRIMER

An effective spray type, low-cost rust primer that resists acids and alkalis.

STEELCOTE MANUFACTURING CO. • 3418 GRATIOT • ST. LOUIS 3, MO., U.S.A.

IN CANADA: STEELCOTE MFG. CO., LTD., RODNEY, ONTARIO

Clear proof you can prevent plugging caused by iron in injection water!
CITRIC ACID ADDED
In this glass, only 10 ppm of Pfizer Citric Acid has been added to brine containing 2 ppm iron
NO CITRIC ACID
The brine in this glass also contains 2 ppm iron. But no citric has been added

● The cloudiness of the brine at right is caused by insoluble iron salts. Continuous injection of this water in secondary recovery causes plugging at the interface.

As you can see from the picture on the left above, Pfizer Citric Acid keeps the iron in your injection water from precipitating out...and thus piling up deposits at the interface.

Net result: Regular use of Pfizer Citric Acid will keep your injection rates high easily and economically. Also cuts down the frequency of expensive acidizing.

Pound for pound, citric acid sequesters iron better and at less cost than any other agent. High calcium and magnesium waters will not interfere with citric's iron-sequestering ability.

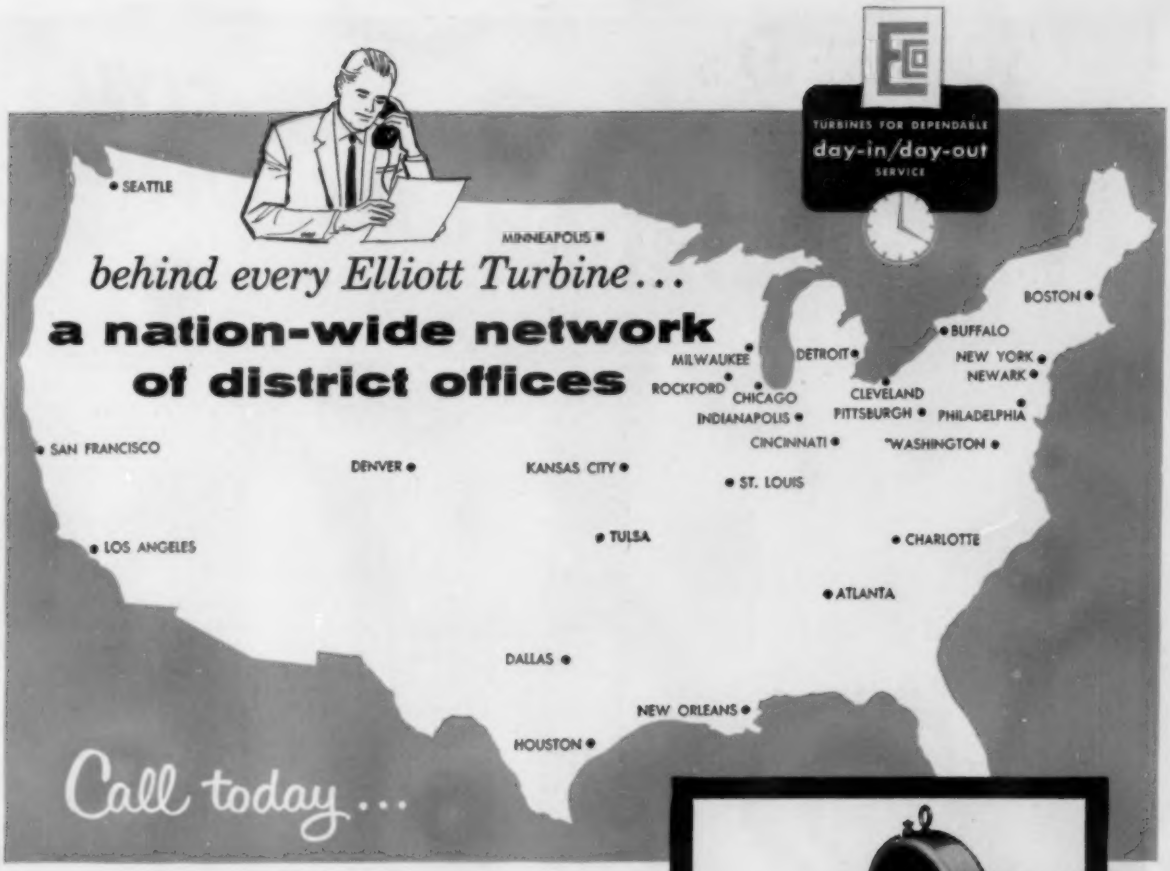
Nontoxic, safe to handle—Pfizer Citric Acid is excellent preventive medicine—whether for secondary recovery or pressure maintenance work. Pfizer supplies huge amounts of citric acid for a multitude of industrial uses throughout the world. This broad distribution pattern assures you of receiving all the citric you need without delay. (Just recently, Pfizer has opened a new warehouse in Dallas to serve the Southwest.)

For further information on preventing injection well plugging with Pfizer Citric Acid write to:

Manufacturing Chemists for Over 100 Years

Pfizer

CHAS. PFIZER & CO., INC.
Chemical Sales Division
630 Flushing Ave., Brooklyn 6, N. Y.
Branch Offices: Chicago, Ill.; San Francisco, Calif.; Vernon, Calif.; Atlanta, Ga.; Dallas, Texas



for application engineering

for operating recommendations

for maintenance service

You don't have to wait several days or even weeks for a delayed mail reply or for a turbine service engineer from a distant head office. Near every Elliott turbine installation—and thousands of Elliott turbines are in operation in process industries everywhere—you'll find an Elliott District Office providing *prompt, fast and efficient service.* Time-consuming red tape and complicated approval systems are strictly taboo.

the Elliott man in the Elliott district office is thoroughly trained to furnish designing specifications, application data, and complete costs on Elliott turbines, from the smallest single-stage to large multi-stage types. He is an engineering expert, fully capable of diagnosing your operating difficulties and of planning an effective maintenance program. Call him today.

ELLIOTT Company

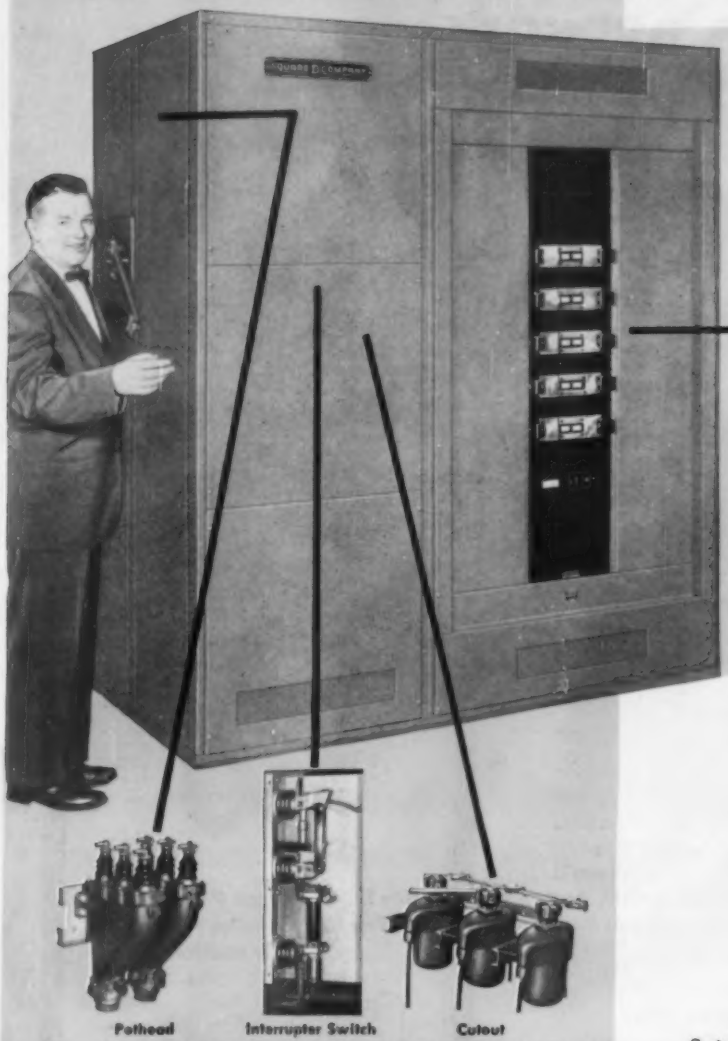
The Elliott "Planned Maintenance" Program eliminates need for large costly inventories

Since YR turbine wearing parts are completely interchangeable, a stock of spares for each turbine is unnecessary. The Elliott field engineer will help you analyze minimum replacement requirements. Ask him for Bulletin H-23, or if you prefer, write Elliott Company, Steam Turbine Department, Jeannette, Pa.

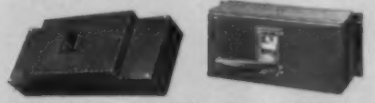
H7-4

Steam Turbines • Motors • Generators • Deaerating Heaters • Ejectors • Condensers • Centrifugal Compressors • Turbochargers • Tube Cleaners • Strainers

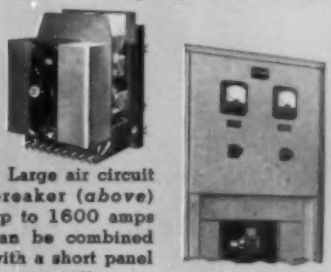
SQUARE D's NEW Unit Substation IN POWER-STYLE CONSTRUCTION



Designed to match Square D's Power-Style switchboards and control centers, these new Unit Substations meet NEMA, ASA, and AIEE standards. Available from 75 to 500 KVA; in primary voltages up to 4800v; secondary up to 600v.



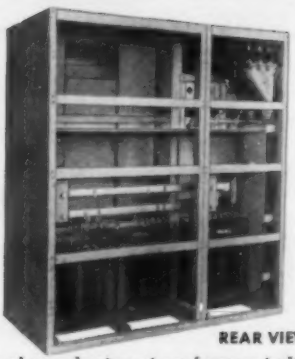
Molded case circuit breakers (*left*) up to 800 amperes and QMB Saflex fusible switches (*right*) up to 600 amperes are available in compact panel construction.



Large air circuit breaker (*above*) up to 1600 amps can be combined with a short panel in one section.

Pothead | Interrupter Switch | Cutout

Potheads, fused or unfused load break air-interrupter switches and fused or unfused oil-filled cutouts are available. Air-interrupter switches and cutouts are easily accessible from front of Substation.

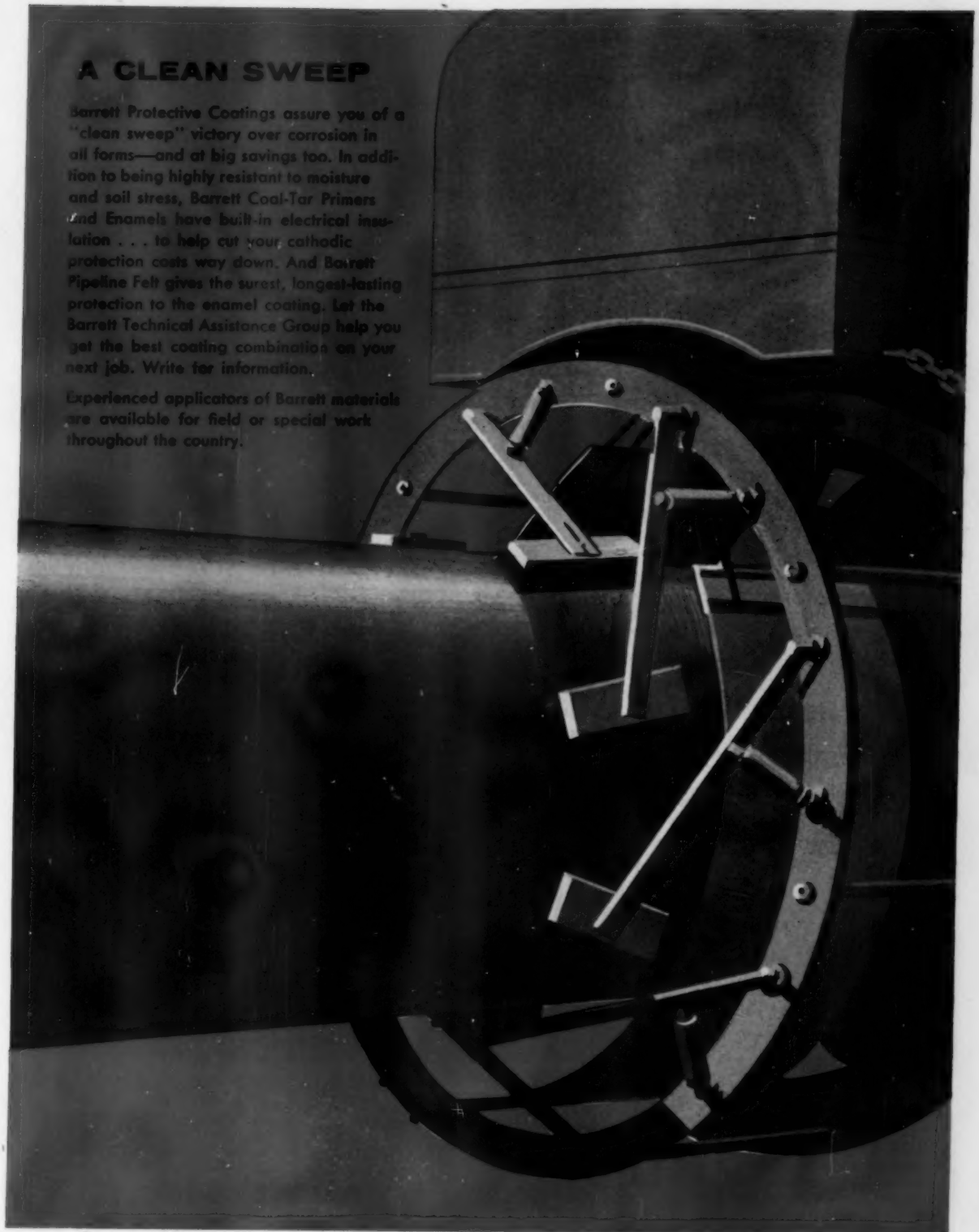


REAR VIEW

3 single phase, dry-type transformers individually mounted on base in ventilated enclosure—heating and vibration held to a minimum. Transformers easily accessible for maintenance and inspection. When no air circuit breaker or metering equipment is used, entire area at top left is available for pull box.

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY


A CLEAN SWEEP
Barrett Protective Coatings assure you of a "clean sweep" victory over corrosion in all forms—and at big savings too. In addition to being highly resistant to moisture and soil stress, Barrett Coal-Tar Primers and Enamels have built-in electrical insulation . . . to help cut your cathodic protection costs way down. And Barrett Pipeline Felt gives the surest, longest-lasting protection to the enamel coating. Let the Barrett Technical Assistance Group help you get the best coating combination on your next job. Write for information.
Experienced applicators of Barrett materials are available for field or special work throughout the country.

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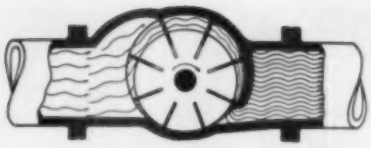
PROTECTIVE COATINGS

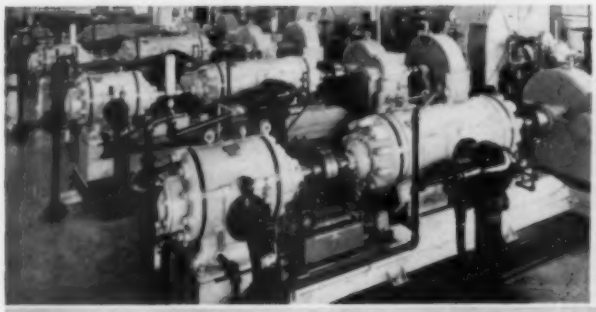
BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, N.Y. In Canada: The Barrett Company, Ltd., 5551 St. Hubert Street, Montreal, Que.

OVER 100 YEARS OF EXPERIENCE

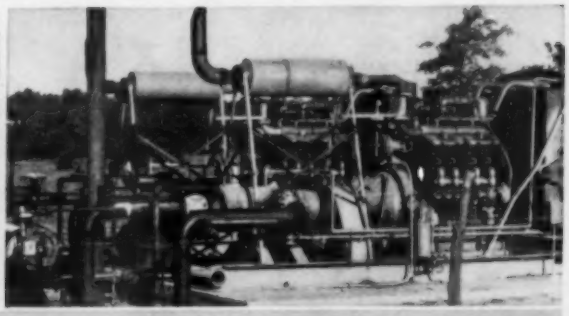
Allied Chemical



This simple rotary principle . . . makes the **FULLER** Compressor incomparable



IN-PLANT SERVICES



GAS GATHERING

The remarkable record of Fuller Rotary Compressors wherever they are used–indoors or out–goes back more than 25 years. Outstanding dependability in operation is based on simplified design. They consist essentially of an eccentrically mounted rotor in a cylinder to form a crescent which is divided into sections by the rotor blades. Each section formed by the rotor blades carries air through the crescent with no reversal of air flow and with measurable improvement in volumetric efficiency. Rotor blades move smoothly by centrifugal force and automatically compensate for wear.

It's as simple as that and the savings realized are significant–in operation and maintenance. Fuller Rotaries operate indefinitely and are literally carefree. They are available in a range of sizes for plant services, refrigeration and gas gathering.

Clip, fill in and mail coupon for detailed information about Fuller Rotary Compressors for plant service, refrigeration or gas gathering.

REFRIGERATION

COST-SAVING ADVANTAGES

1. Smooth, pulse-free, one-way air flow.
2. Lack of vibration permits use of light foundation.
3. Far fewer moving parts insure low maintenance.
4. Small size for high capacity permits installation in minimum space.
5. Direct drive further reduces space requirements.
6. Valveless design permits continuous-unsupervised operation and greatly reduces maintenance costs.

Fuller Rotary Compressors:

- Maintain original capacity for the life of the machine.
- Provide a high degree of reliability, thereby reducing standby capacity requirements.
- Have few moving parts, thus sharply reducing parts inventory.
- Require minimum supervision and inspection.

It will pay you to compare Fuller Rotaries with other compressors and evaluate Fuller advantages to your operation in terms of annual net savings. Fuller Rotaries are available for industrial pressures to 125 psig and capacities to 3300 cfm. We will be glad to supply you with facts based on actual experience with Fuller installations over the past 25 years.

FULLER COMPANY
132 Bridge St., CATASAUQUA, PA.

Please send me, without obligation, descriptive literature on the Fuller Rotary Compressor. I am specifically interested in:

☐ Plant Services ☐ Refrigeration ☐ Gas Gathering

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TITLE_____

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FULLER COMPANY
132 Bridge St., Catasauqua, Pa.

SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION

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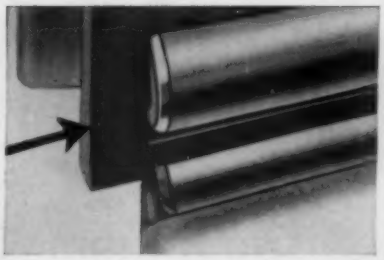
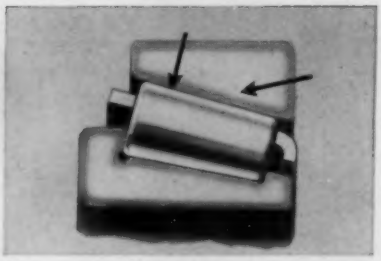
PIONEERS OF HIGH-EFFICIENCY VANE TYPE ROTARY COMPRESSORS SINCE 1930

Get all these advantages . . . specify TIMKEN® tapered roller bearings

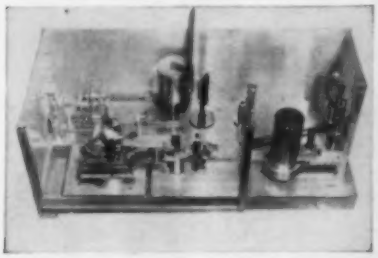
THERE ARE 27 TYPES of Timken® tapered roller bearings. This wide selection means you get the bearing design exactly suited to your job. Whatever your bearing application problem, we can help solve it.



THE SOFT STEEL CAGE used in Timken tapered roller bearings separates the rollers, keeping them spaced evenly. This prevents scuffing of the rollers, adds to the bearing life and gives you more for your money.

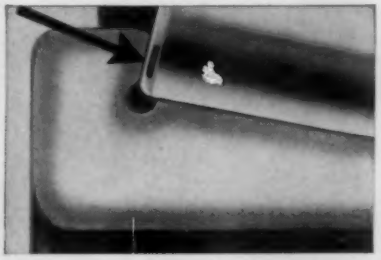


HARD ON THE OUTSIDE, tough on the inside. To take shock loads, give longer life, Timken bearing rollers and races are case-carburized to have a hard, wear-resistant surface over a tough, shock-resistant core.



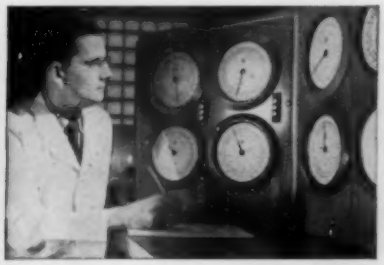
MICRO-INCH FINISH is standard for Timken bearings. This profilograph checks contours and smoothness of circular surfaces to a millionth of an inch, helps us make Timken bearings truer, quieter, longer-wearing.

6,525 SIZES, the world's largest selection of tapered roller bearings. From bearings smaller than your finger to 71½" in inside diameter, the Timken Company can supply the size you need for any specific application.

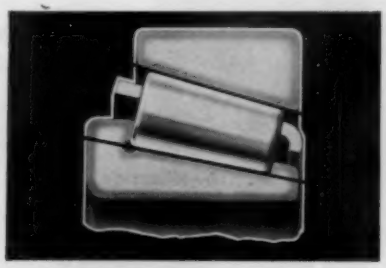


POSITIVE ROLLER ALIGNMENT is assured because the taper in Timken bearings holds ends of rollers snug against the rib. The taper in Timken bearings lets them take radial or thrust loads or any combination.

ACCURATE TO 50 MILLIONTHS of an inch. This Universal Measuring Machine checks gages and machine parts used to make Timken bearings. Our gage laboratory, one of the world's best equipped, helps make Timken tapered roller bearings your No. 1 bearing value.



WE MAKE OUR OWN FINE ALLOY STEEL. No other American bearing maker does. This spectrometer helps control steel quality—in 40 seconds gives the exact chemical analysis of a melt. In a few minutes, results are flashed to the melter. It's another step in rigid quality control.



FULL LINE OF CONTACT between Timken bearings' rollers and races gives them *extra* load-carrying capacity. To get *all* these advantages, specify "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN *TAPERED ROLLER BEARINGS ROLL THE LOAD*

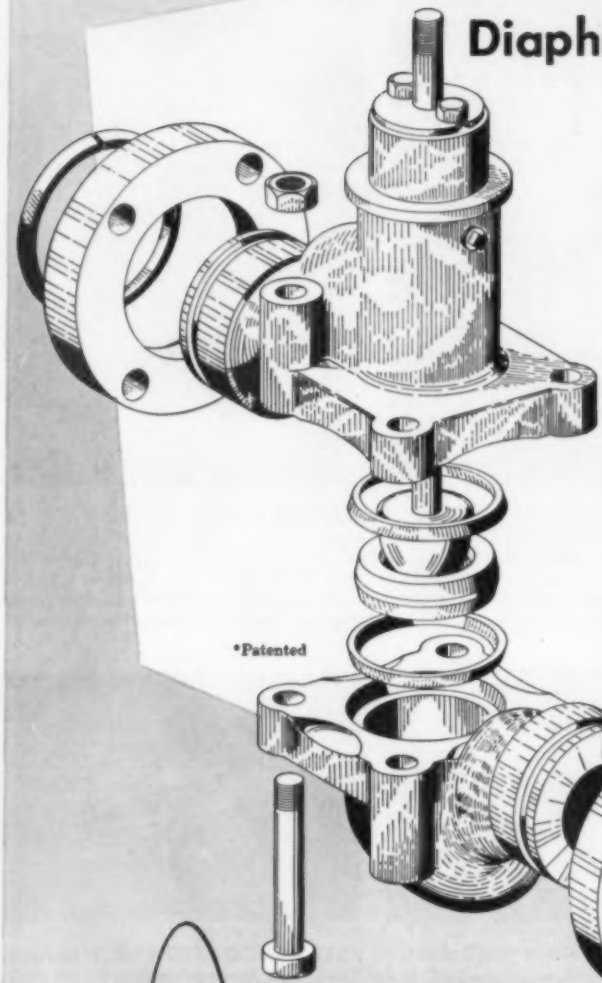
TRADE-MARK REG. U. S. PAT. OFF.

For Complex Fluid Control Problems . . .

Specify The New SPLIT BODY

Super 70 series

Diaphragm Control Valves!



*Patented

FEATURES

✓ Body halves are joined with four bolts at junction of valve body and inner valve seat for easy access. May be assembled to provide either globe or side angle flow.

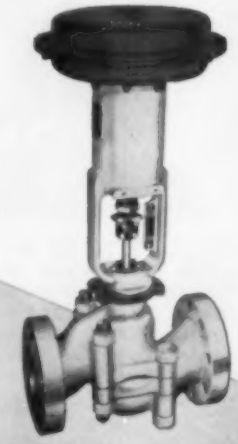
✓ Seats are available in metal, Nylon, Teflon or Kel-F.

✓ Tight closures without resort to gaskets are insured by BS&B Float Ring Seals.*

✓ Actuator may be quickly oriented to any convenient position by means of clamp ring mounting.

✓ Fewer parts mean simplified maintenance when handling erosive, corrosive or viscous liquids.

✓ Standard body materials are cast steel or 316 stainless in 1" to 3" sizes with a selection of inner valve types. 600 lb. ASA body with interchangeable line flanges—150, 300 and 600 lb. raised face. Other body materials available on special order.



EFFICIENCY BS&B RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

For Complete Information, Ask Your BS&B Sales Engineer—or Write for Catalog 70-11.

BLACK, SIVALLS & BRYSON, INC.

Controls Division, Dept. 4-A5

7500 East 12th Street Kansas City 26, Missouri

here's how Baash-Ross

PRODUCTION SAFETY JOINTS

assure important savings in production operations . . .

INSTALLED ABOVE THE PACKER—where production packers are used—to permit positive release of a tubing string should the packer become stuck.

PERMIT SELECTIVE release and maximum recovery when one or more is used in the tubing string where sanding conditions exist.

ALLOWS CHANGE in production methods quickly and easily without disturbing the packer when installed in the tubing string.

For further information write P.O. Box 1248, Houston 1, Texas or see The Composite Catalog.

BAASH-ROSS PRODUCTION SAFETY JOINTS are run in the tubing string to provide a positive means of freeing the string at the point where the Safety Joint is installed. They are designed with a unique locking type lug which permits heavy rotational loads to be transmitted through the Joint without loosening or overtightening it—yet disengagement can be made with approximately 5 turns by following a simple sequence of operations. Buy through your supply store.

BAASH*ROSS
TOOL COMPANY
DIVISION OF JOY MANUFACTURING COMPANY

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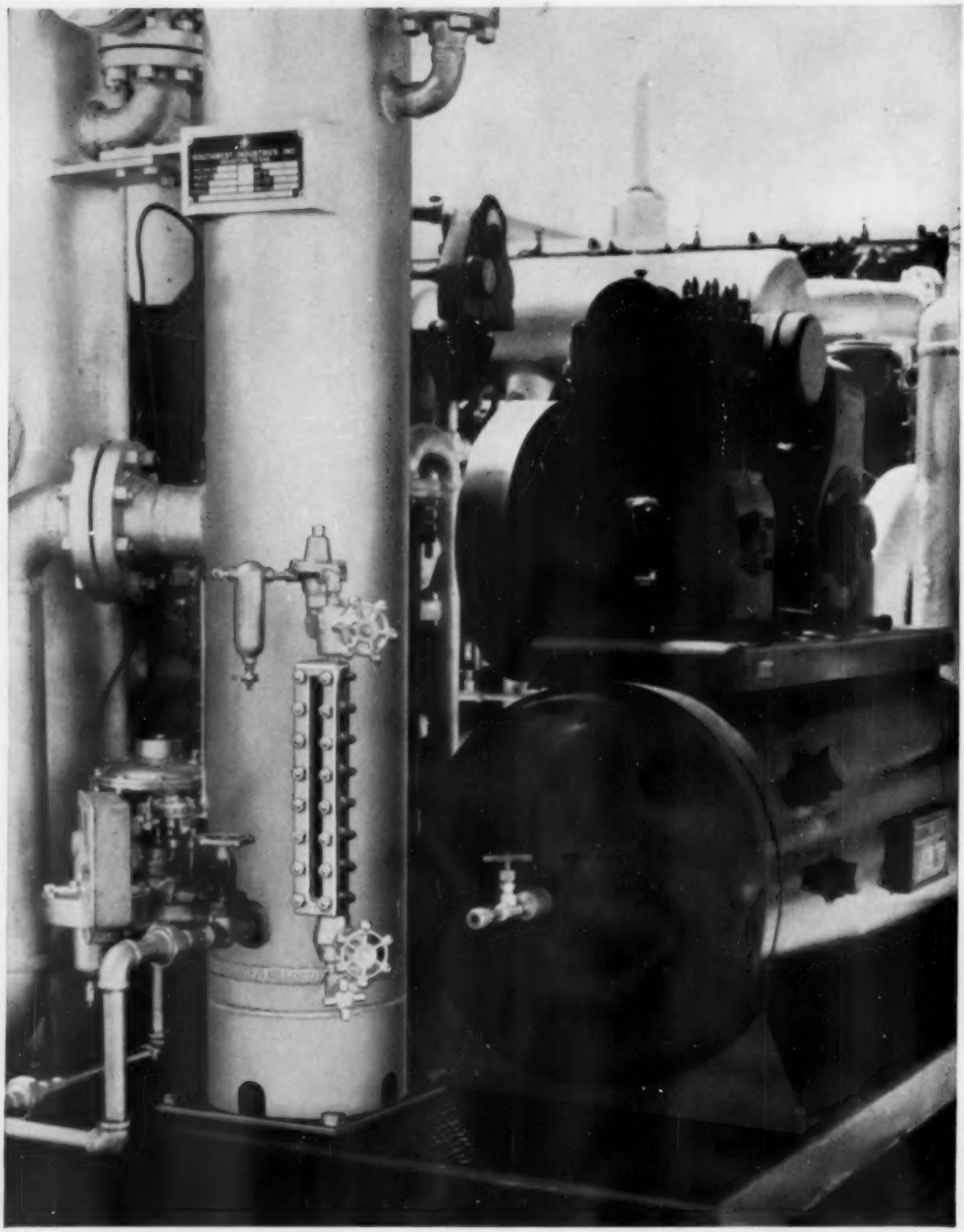


● **PENBERTHY** high pressure gage on Continental Tank Company separator.
Republic Natural Gas Company, C. D. Williams #2, Eola Field, Garvin County, Okla.

Everywhere... **YOU'RE SEEING MORE PRODUCTS BY**

PENBERTHY MANUFACTURING COMPANY

Division of Buffalo-Eclipse Corporation

1242 Holden Avenue **Detroit 2, Michigan**

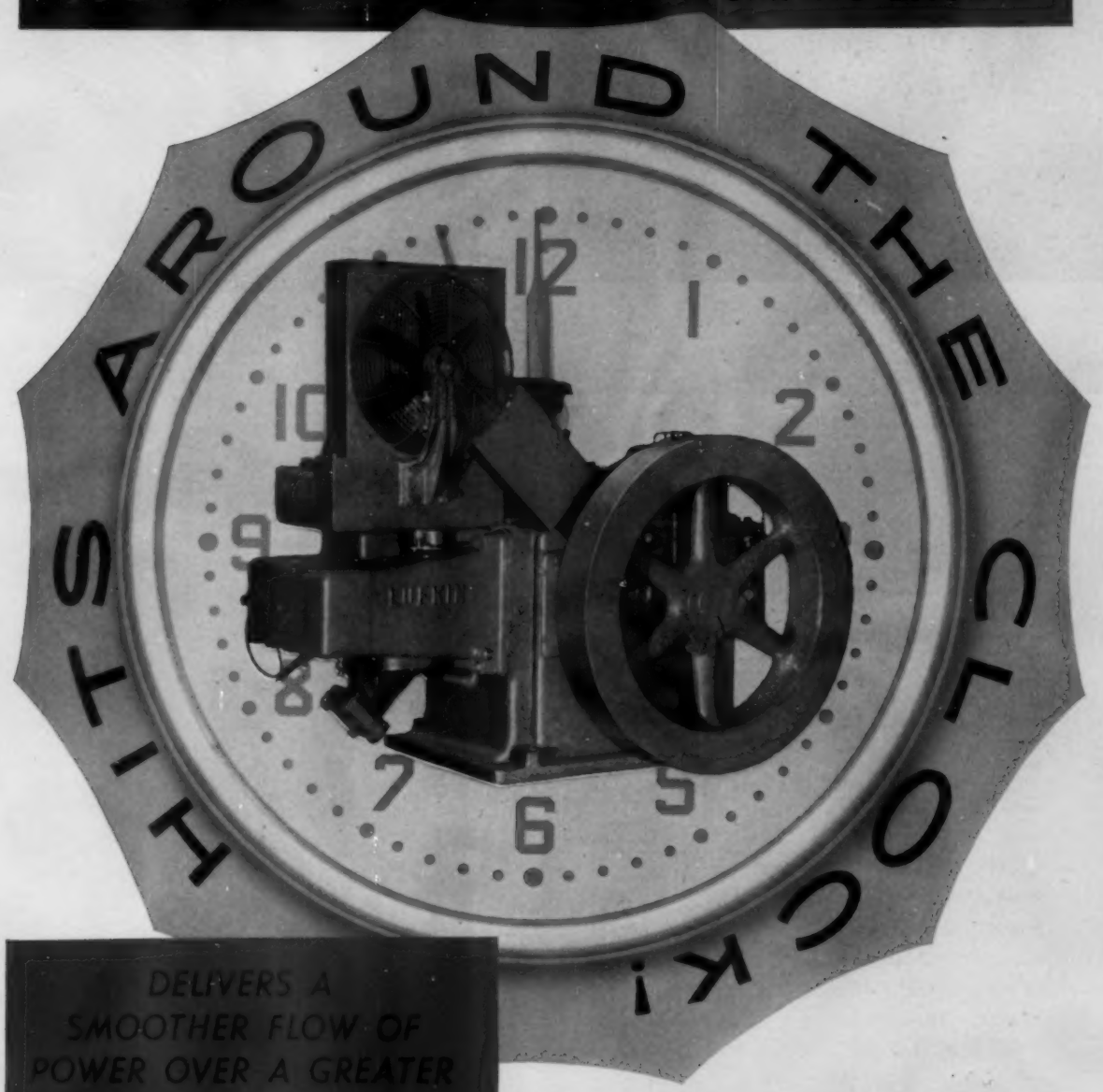
PENBERTHY

- EJECTORS
- INJECTORS
- CYCLING JET PUMPS
- ELECTRIC SUMP PUMPS
- LIQUID LEVEL GAGES
- GAGE VALVES

LUFKIN'S NEW H-333-B

- *Two Cycle*
- *Two Cylinder*

PUMPING ENGINE



DELIVERS A SMOOTHER FLOW OF POWER OVER A GREATER RANGE OF OPERATING SPEEDS AND LOADS

- **New extra heavy flywheel minimizes change in speed during pumping cycle.**
- **New Intake Port and Piston Design for Better Fuel Distribution and More Complete Combustion, resulting in shock free "Around the Clock" firing.**

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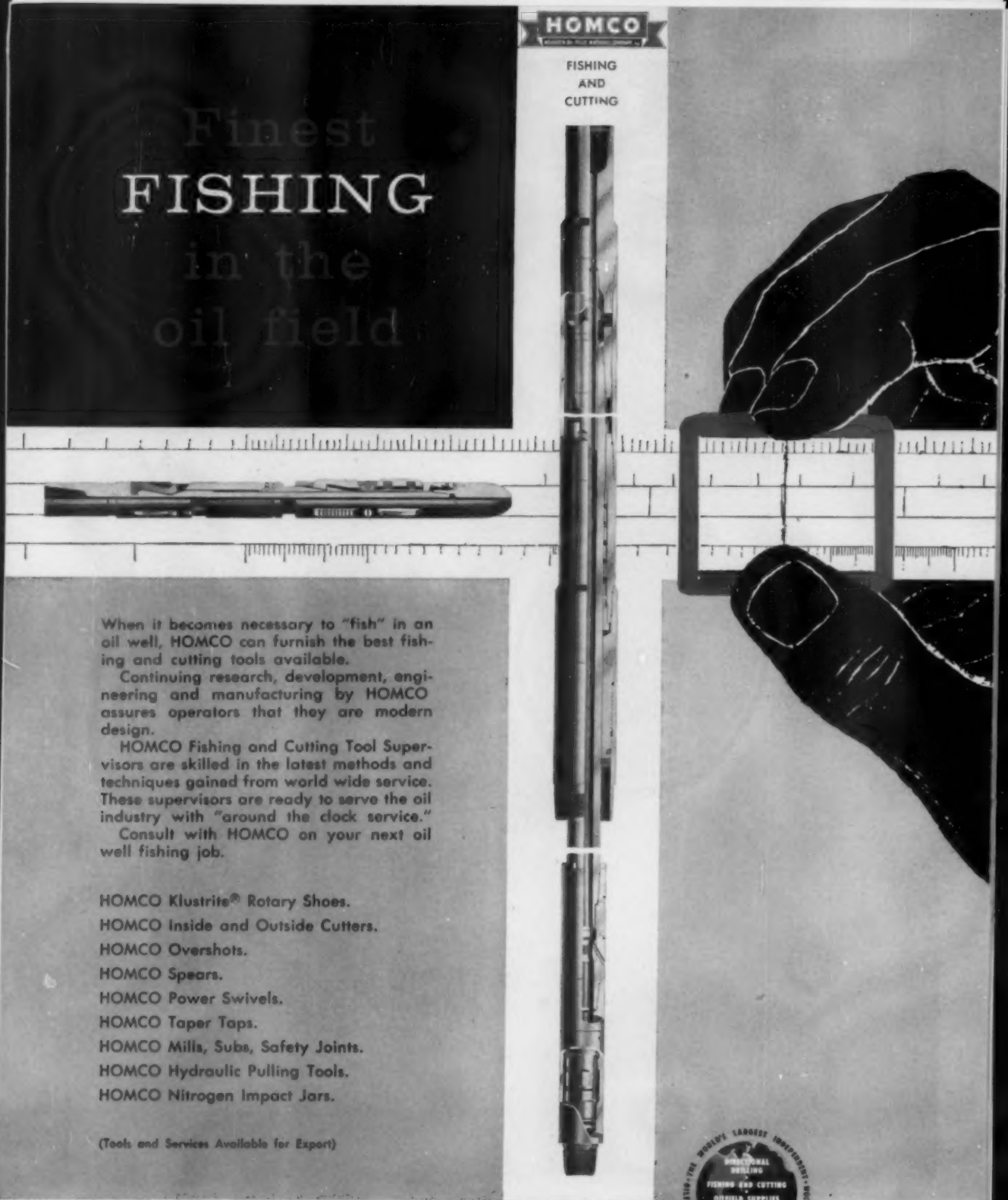
Lufkin equipment in Canada is handled by
THE LUFKIN MACHINE CO., LTD., 9950 65th Avenue, Edmonton, Alberta, Canada, Regina, Saskatchewan, Canada

Finest FISHING in the oil field

HOMCO

FISHING AND CUTTING



When it becomes necessary to "fish" in an oil well, HOMCO can furnish the best fishing and cutting tools available.

Continuing research, development, engineering and manufacturing by HOMCO assures operators that they are modern design.

HOMCO Fishing and Cutting Tool Supervisors are skilled in the latest methods and techniques gained from world wide service. These supervisors are ready to serve the oil industry with "around the clock service."

Consult with HOMCO on your next oil well fishing job.

HOMCO Klustrite® Rotary Shoes.
HOMCO Inside and Outside Cutters.
HOMCO Overshots.
HOMCO Spears.
HOMCO Power Swivels.
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HOMCO Mills, Subs, Safety Joints.
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(Tools and Services Available for Export)

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THE WORLD'S LARGEST INDEPENDENT OILFIELD SUPPLY AND SERVICE ORGANIZATION

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They Say—

Clear-cut gas rules needed

"The gas industry needs very badly for Congress to specify the rules by which the FPC can discharge its obligations as a regulator of producers, and I am very hopeful that the new Harris bill . . . will get prompt and favorable attention.

"Once this question is resolved one way or another, we feel quite confident that the producers will be willing to sell. . . ."

Tom P. Walker, chairman of the board, Transcontinental Gas Pipe Line Corp., in a statement at the company's annual stockholders' meeting.

Another prophecy is made

Your article "A Prophecy is Fulfilled" *(The Oil and Gas Journal, April 15, 1957, page 197)* dealing with a Shell strike in Oldham County and the fact that it had been mapped by Gould in 1919 is interesting.

I did considerable reconnaissance work out there in 1918-19 myself; in fact, sketched the Bravo Dome and several others on the New Mexico side. I think Dr. Charles Gould did an excellent piece of work and deserves a great deal of credit for his discovery. Good to see that his prophecy was fulfilled. I quite agree with you that the Palo Duro basin has considerable promise.

. . . The Four Corners play unquestionably stimulated activity in Arizona and within the next few years we should have the answer of whether or not the Black Mesa basin will prove productive.

Pessimists say we have found most of the oil we are going to find. I am just optimistic enough to believe that there is still oil to be found, not only on surface geology but tremendous volumes in stratigraphic traps. With improved techniques, especially better logging and the developing of sand-fracing, numerous plays that heretofore were passed over will be redrilled.

I think this particularly applies to the Uintah basin which is having considerable revival of interest especially for natural gas and oil. It may not equal the San Juan basin as a gas producer; nevertheless, it will be a very important

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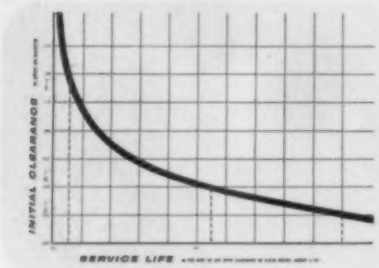
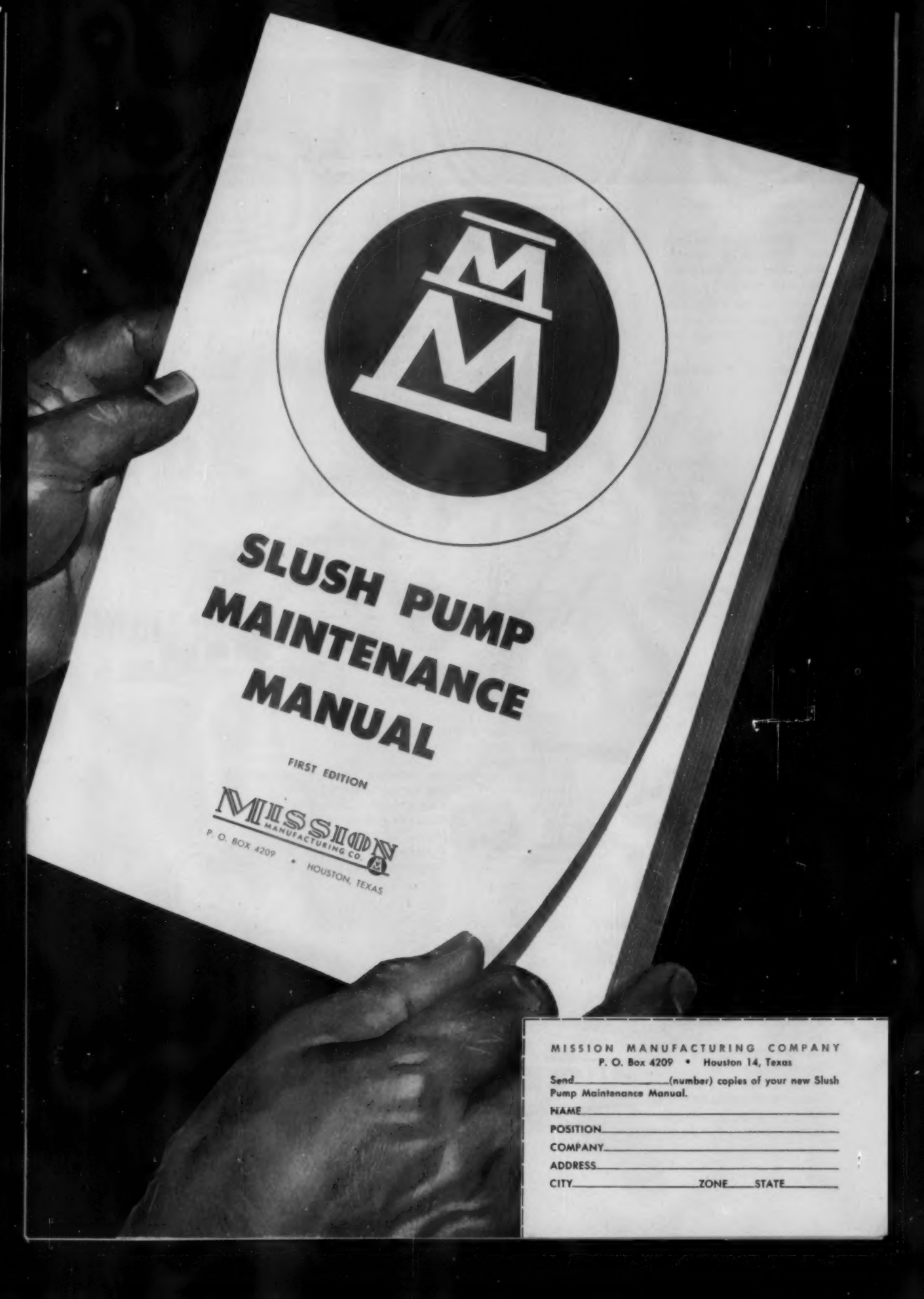
Want to know the best time to change pistons and liners? The Pump Maintenance Manual has the answer.



Want to know the correct way to replace pump parts? This book has dozens of proved suggestions.

Want to know how to speed slush pump repairs? Just look in the Pump Maintenance Manual.

Want to know how to find the cause of knocking? This book offers dozens of pointers.



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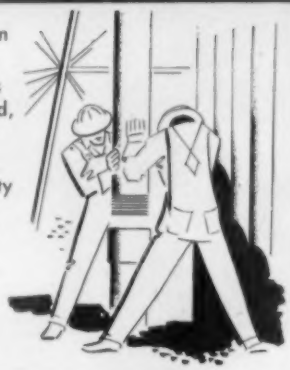

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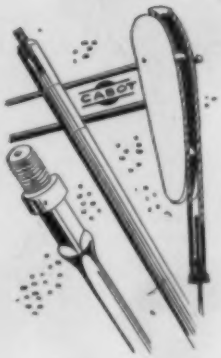

J&L shops make Axelson pumps a blue-chip investment. These shops tailor pumps to fit your wells — make misfits a thing of the past. Later, trained J&L men working with highly specialized equipment and complete parts inventories make worn pumps as good as new — literally. An oil field axiom: Never junk an Axelson; J&L can fix it.

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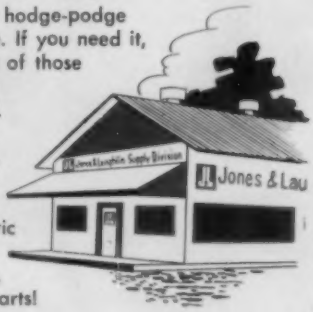

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gas area and of similar type, as the gas fields will all be in stratigraphic traps.

Dorsey Hager
Consulting Geologist
Salt Lake City.

Zante success forecast

Dear Sir:

Re the article concerning the drilling of exploratory wells on the Greek island of Zante, on page 114 of your March 11 magazine.

It is my considered opinion that at least two oil sands will be found, one at approximately 1,500 ft., the second one at approximately 1,900 ft. Both zones should be productive, even if limited.

The above is a deduction I have arrived at independently and it will be interesting to see if it is correct.

Quentin P. Szekley
Pacific Palisades, Calif.

Private investment abroad

"No unprejudiced observer regards the whole foreign-aid program as one big rathole down which all the dollars simply disappear, but any qualified observer will agree that the more private investment we have, the less we need to spend for foreign-aid programs.

"... Free enterprise and democracy here at home will not continue to prosper unless we in business—private citizens apart from Government—take the responsibility of contributing to this process of growth. . .

"Accepting the fact that we are in for a long period of continuing demands for economic assistance to the underdeveloped countries, it would seem the plain part of good sense for industry to shoulder all that it profitably can. It is peculiarly the obligation of American management to promote free enterprise abroad."

T. S. Petersen, president, Standard Oil Co. of California, in a speech before the Society for the Advancement of Management, Dallas chapter.

Is union regulation needed?

"There are many members of Congress who have expressed great concern over their fear that the smaller companies in the oil industry are dominated by the larger companies. They do not recognize, or do not want to recognize, the fact that many of the smaller companies are more disturbed by pressure from large unions than they are by any activities of their larger competitors.

"We do not want to see any of the gains that workers have won taken from them, but we do think that it is

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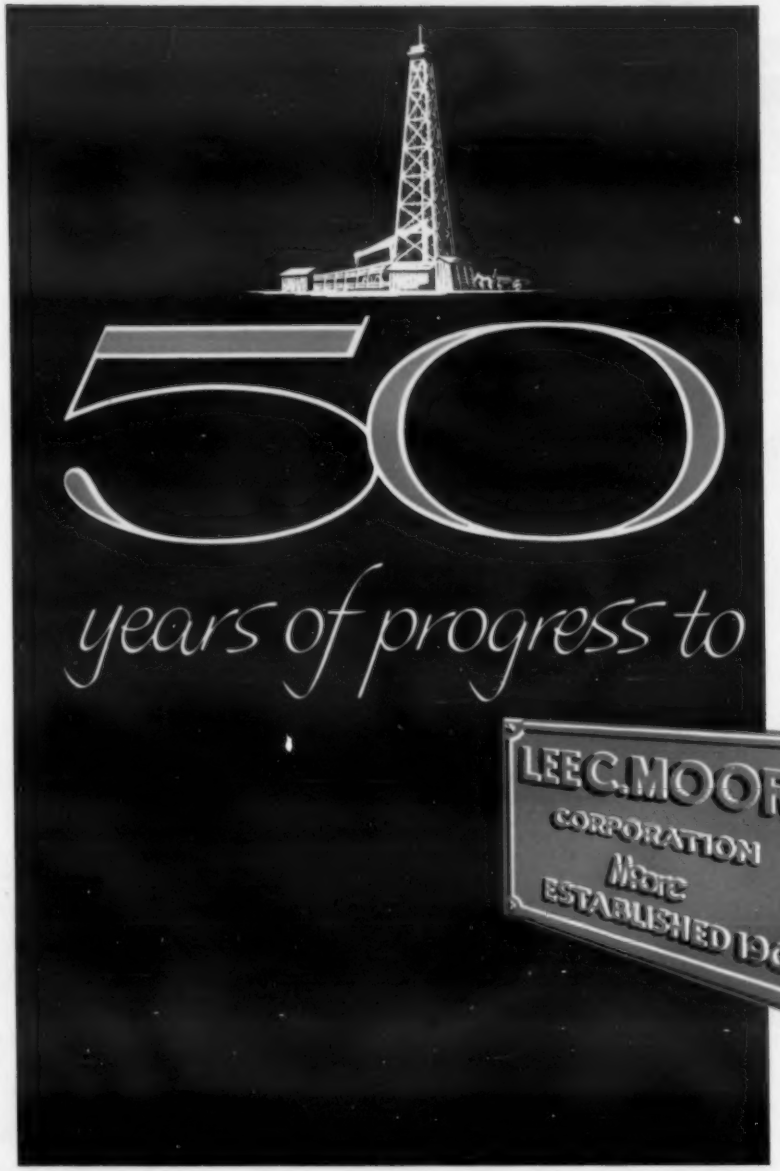

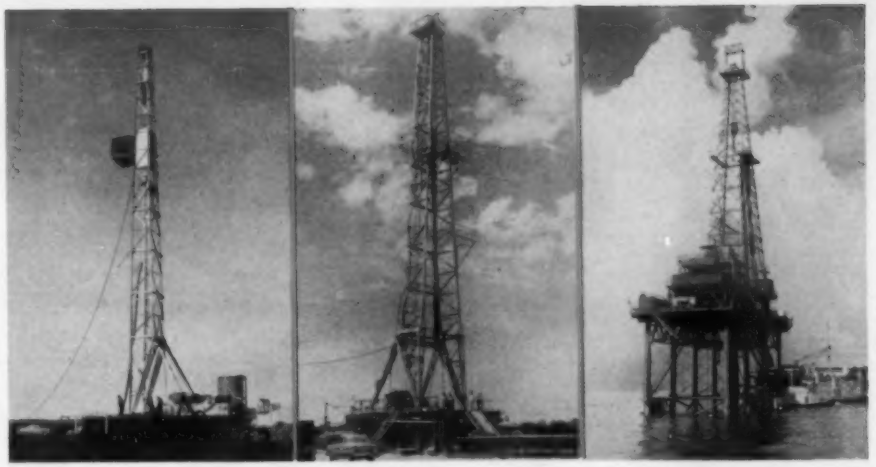

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imperative Congress provide some regulation of labor unions to protect the workers and the public against abuses and to make it possible for local unions and their own employers to negotiate at the local level instead of being forced to accept a national 'pattern.' "

G. B. Hunter, president, National Petroleum Association, in a speech at the NPA semiannual meeting, Cleveland.

Oil earnings down since '52

"In January of this year, domestic crude-oil prices were advanced approximately 29 cents and Senator O'Mahoney, chairman of the Senate subcommittee which has been conducting hearings on this subject, publicly conceded that this action was justified 'because many other prices have been increased and the price of crude oil has not been changed in several years.'

"The subsequent rise in the prices of refinery products was an effort to offset this higher crude cost. However, this offset has not been fully achieved; neither have refined-product prices kept pace with increases in the prices of other consumer items.

"As to oil-company earnings, according to a financial study, the return for 14 domestic integrated oil companies, including Cities Service, was 6.24 per cent for 1955, the latest year for which figures for the group are available. This represents a decline from 6.7 per cent in 1952."

W. Alton Jones, chairman of the board, Cities Service Co., in an editorial in the company magazine, "Service."

Money distracts scientists

"We should avoid overemphasizing the necessity for our research people to produce results measureable in dollars and cents. A scientist can't do his best work with one eye glued to the microscope and the other to the cash register."

W. Furness Thompson, vice president in charge of research and development, Smith, Kline & French Laboratories, in a speech before the National Industrial Research Conference.

Offshore wildcat results

"Reflecting a lower percentage of dry holes offshore, figures reveal that for each dry hole drilled, over 11 times as many hydrocarbons were found offshore.

"Of the 243 new field wildcat wells drilled through last year, 39 per cent off Louisiana have produced while only 15 per cent off Texas produced.

"Year in and year out the national average is a little over 11 per cent."

Ira H. Cram, senior vice president, Continental Oil Co.

CALENDAR OF EVENTS

MAY

6-8 American Petroleum Institute, annual pipeline conference, Cleveland Hotel, Cleveland.

7 American Gas Association, committee on underground storage, operating section, Mark Hopkins Hotel, San Francisco.

8-10 Canadian Institute of Mining and Metallurgy, eighth annual convention, petroleum and natural-gas division, Macdonald Hotel, Edmonton.

8-10 American Gas Association, Pacific Coast Gas Association, gas supply, transmission, and storage conference, Mark Hopkins Hotel, San Francisco.

8-10 American Association of Oilwell Drilling Contractors, conference for drilling executives, Lassen Hotel, Wichita, Kans.

9 Panhandle Producers and Royalty Owners Association, annual meeting, Herring Hotel, Amarillo, Tex.

16 S's

These Standard "S" Assemblies / Are Used for These Otis Sub-Surface Controls	Locking Assembly	Locator Assembly	Equalizing Valve	Conc. X-O Assembly	Bean Cage	Sub	Ring Check Assembly	Combination Adapter	Pack. Man. Sub-Assy.	Side Port Adapter	Sep. Tool Eq. Valve	Spacer Sub	Side Port Comb. Adpt.
1 Cross-Over Choke	S	S	S	S	S								
2 Regular Flow Choke	S	S	S		S			S	S				
3 Dual Side-Door Choke	S	S	S		S			S	S				
4 Dual Separation Tool	S	S						S	S	S	S		
5 By-Pass Side-Door Choke	S	S	S		S				S				
6 By-Pass Separation Tool	S	S							S		S	S	
7 Side-Door Choke	S	S	S		S				S				
8 Separation Tool	S	S							S	S	S		
9 Lower Zone Acidizing Tool	S	S	S		S			S	S				S
10 Upper Zone Acidizing Tool	S	S						S	S	S	S		S
11 Circulating Tool	S	S	S					S	S		S		S
12 Side Port Nipple Choke	S	S	S		S	S			S				
13 S-P Nip. Separation Tool	S	S				S			S	S	S		
14 Plug Choke	S	S									S		
15 Lower Zone } Ring Check {	S	S	S		S		S		S				S
16 Upper Zone } Acidizing Tool {	S	S					S		S	S	S		S

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9-10 Fourth annual heat-transfer conference, Oklahoma A. & M. College, Student Union Building, Stillwater, Okla.

9-10 Symposium on use of surface active agents in water flooding, Pennsylvania State University, department of petroleum and natural gas, State College, Pa.

12-15 Liquefied Petroleum Gas Association, annual meeting, Conrad Hilton Hotel, Chicago.

13-15 Industrial Waste Conference, sponsored by Purdue University, Purdue Memorial Union Building, Lafayette, Ind.

13-16 American Petroleum Institute, division of refining, midyear meeting, Sheraton Hotel, Philadelphia.

13-17 American Petroleum Institute, safety and fire protection committees, Hotel President, Kansas City.

14-16 Industrial Nuclear Technology Conference, sponsored by Armour Research Foundation of Illinois Institute of Technology and Nucleonics Magazine, Museum of Science and Industry, Chicago.

14-16 American Petroleum Institute, central committee on highway transportation, Cosmopolitan Hotel, Denver.

16-17 American Right of Way Association, third annual national seminar, Conrad Hilton Hotel, Chicago.

16-17 American Petroleum Institute, division of production, Pacific Coast district meeting, Hotel Biltmore, Los Angeles.

16-18 Geological Society of America, southeastern section, annual meeting, Morgantown, W. Va.

19-22 Texas Independent Producers and Royalty Owners Association, Galvez and Buccaneer Hotel, Galveston, Tex.

20-22 American Petroleum Institute, división of transportation, central committee on transportation by water and tanker corrosion symposium, San Francisco.

20-22 American Gas Association, chemical, engineering, and manufactured gas production conference, Balmoral Hotel, Bal Harbour, Fla.

20-23 American Society of Mechanical Engineers, twenty-ninth annual conference and exhibit of the oil and gas power division, Kentucky Hotel, Louisville, Ky.

21-23 Pennsylvania Gas Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

22-24 American Association of Oilwell Drilling Contractors, conference for drilling executives, Houston.

23-24 Kentucky Oil and Gas Association, annual membership meeting, Hotel Phoenix, Lexington, Ky.

23-24 American Institute of Mining, Metallurgical, and Petroleum Engineers, third annual joint meeting, Rocky Mountain petroleum sections, Northern Hotel, Billings, Mont.

23-24 Western Petroleum Refiners Association, southwest regional technical-industrial relations meeting, Hotel Paso del Norte, El Paso, Tex.

27-29 Rocky Mountain Oil and Gas Association, twelfth annual convention, Denver.

29-31 Annual short course in gas technology, Texas College of Arts and Industries, Kingsville, Tex.

JUNE

3-5 Petroleum Electric Power Association, annual convention, Amarillo, Tex.

3-7 Oil-Heat Institute of America, thirty-fifth annual convention, Sheraton-Plaza Hotel, Boston.

4-6 Second annual Appalachian Under-

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ground Corrosion Short Course, West Virginia University, Morgantown, W. Va.

6 Pennsylvania Grade Crude Oil Association, thirty-fourth annual meeting, Penn-Sheraton Hotel, Pittsburgh.

9-13 American Society of Mechanical Engineers, semiannual meeting, Sheraton-Palace Hotel, San Francisco.

10-12 Interstate Oil Compact Commission, midyear meeting, Yellowstone National Park.

10-14 Gordon Research Conferences, petroleum, Colby Junior College, New London, N. H.

12-14 Engineering Institute of Canada, annual meeting, Banff, Alta.

16-21 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

17-21 Gordon Research Conferences, catalysis, Colby Junior College, New London, N. H.

18-19 Rocky Mountain Oil and Gas Association, annual meeting of refining committee, Northern Hotel, Billings, Mont.

19-21 Association for Computing Machinery, twelfth annual meeting, University of Houston, Houston.

20-21 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Broadview Hotel, Wichita.

20-22 National Oil Scouts and Landmen's Association, annual meeting, Hotel Cosmopolitan, Denver.

23-27 Canadian Gas Association, Jasper Park Lodge, Jasper, Alta.

JULY

8-19 Industrial Statistics for the Process Industries, second annual conference, sponsored by American Society for Quality Control and the University of Oklahoma, Lockett Hotel, Norman, Okla.

AUGUST

26-28 Seventeenth annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

28-30 Instrument Society of America, International Symposium on gas chromatography, Kellogg Center, Michigan State University, East Lansing, Mich.

SEPTEMBER

3-5 Pacific Coast Gas Association convention, Fairmont and Mark Hopkins Hotels, San Francisco.

5-7 New Mexico Geological Society, eighth annual field conference, southwestern Colorado.

8-13 American Chemical Society, 132nd national meeting, New York City.

9-10 Independent Natural Gas Association of America, annual meeting, Shamrock Hilton Hotel, Houston.

11-13 National Petroleum Association, fifty-fifth annual meeting, Traymore Hotel, Atlantic City, N. J.

19-21 Rocky Mountain Oil Show, fairgrounds, Casper, Wyo.

23-25 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Mayo Hotel, Tulsa.

26-27 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

26-27 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, Roosevelt Hotel, New Orleans.

30-Oct. 2 American Oil Chemists' Society, 1957 fall meeting, Netherland Plaza Hotel, Cincinnati.

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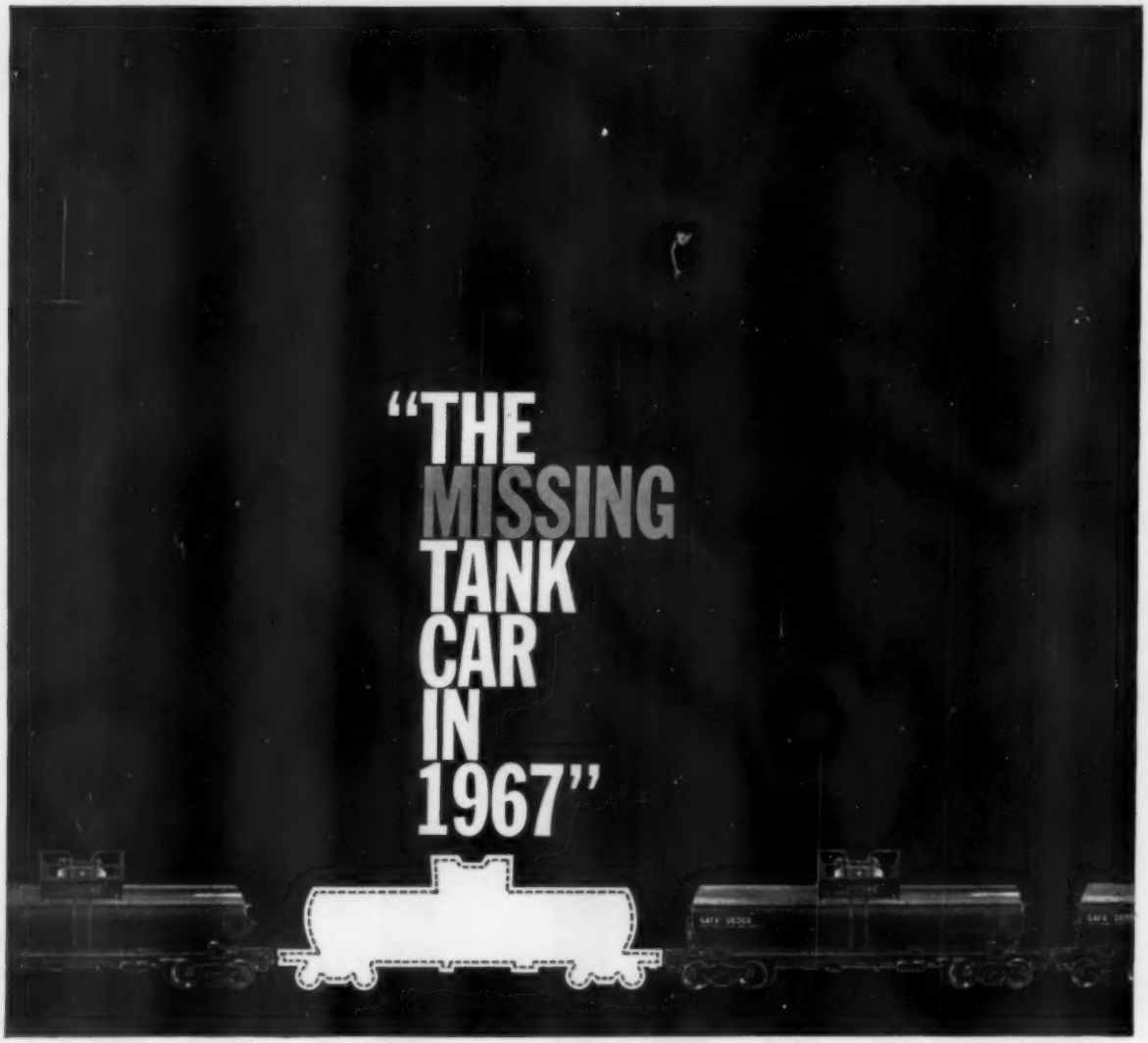

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JOURNALLY SPEAKING

$$\hat{P}_{jk} = \bar{P} + \sum_{r=1}^{6} Z_r \cdot S \cdot f_{rj} + \sum_{s=1}^{4} \cdot Z_s \cdot S \cdot g_{sk} + \sum_{r=1}^{4} \sum_{s=1}^{3} Z_{rs} \cdot S \cdot f_{rj} \cdot g_{sk}$$

THE above equation may be worth $100,000,000 to the oil and gas industry.

It's the first step in an attempt to get the weather translated into terms that oil men can understand and use.

Now this is progress. The weather has been as big a mystery to oil men as it has to everybody else. But if we can reduce the weather to an equation like this it will simplify the whole thing and we may be able to get somewhere.

At least that seems to be the theory that the A.P.I. is working on. It is planning to give financial support to some research projects in long-range weather forecasting. And at least some of the dough is expected to go to the genius who doped out this equation—a former M.I.T. professor of meteorology named Dr. Thomas F. Malone.

This particular equation is Dr. Malone's picture of the atmosphere over the North American Continent. We won't try to explain it here, but it ought to be right down the alley of all engineers. Certainly it's a lot simpler than some of the equations we have run in the long-haired parts of the Big Yellow Book.

With weather information put into engineers' language this way it should be relatively simple for oil companies to run such formulas through their electronic computing machines and come out with solutions to problems that now keep them in perpetual tizzies.

For instance, a few equations like this will tell when the first freeze is going to hit Kokomo, Ind., giving the filling stations plenty of time to stock up on radiator antifreeze. And by knowing how cold it's going to be in Oshkosh, Wis., next Christmas and how hot it will be at Coney Island on Fourth of July, the Texas Railroad Commission could set its allowables a year in advance.

Problems like that are said to cost the oil and gas industry $100,000,000 a year by guessing wrong on the weather. That's why the A.P.I. decided it ought to kick in a little for some weather research. But it didn't know where to start until this Professor Malone came along with an understandable formula.

This Dr. Malone is a smart cookie, all right. He understands the oil industry's psychology, and uses it to sell his services. First he appealed to the engineers by talking their language of equations. And without the support of the engineers you can't get anywhere in the oil business.

But he also knew that the people who hire engineers are gamblers. (You can take that any way you want to.) So he devised another gimmick to appeal to the gambling spirit of the risk-taking, bet-placing, hunch-playing, independent-spirited, free-enterprising individualists who make their business decisions in the best wildcatting traditions.

Dr. Malone phrases his forecasts in the language of a bookmaker. He might tell an oil company, for example, "the odds are 1 to 10 that your offshore drilling rig will be hit by a hurricane next Tuesday, but only 1 to 17 a week from Thursday," or "the odds are 5 to 4 that it will be 6° colder in Milwaukee next January, and 7 to 13 that it will be 20° colder."

That's the kind of talk that a rugged individualist likes to hear. It gives him a chance to play the odds, test his luck, and exercise his executive judgment. Let the engineers work out the odds with their equations and then let management make the decisions.

The heck with the old-fashioned, mamby-pamby, noncommittal partly-cloudy-with-possibly-scattered-showers type of forecasting. Now that we've got science into the game, playing the weather will be just like figuring the odds on a poker hand.

Maybe these are the reasons why the professor's system appeals to the A.P.I.; or there may be other reasons.

But we'll bet one thing—and give odds, too: No matter how well this equation works other places, it won't be able to predict Oklahoma weather.

—Henry D. Ralph.

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The Harris bill has a stiff price but it's worth buying

THE more the new Harris gas bill is studied, and the more that is learned about the political jockeying behind its various provisions, the more it looks like a good buy for producers.

The price is stiff. Producers agree to a certain amount of federal control. They give up several types of escalation devices. They surrender hope of raising many old low-price contracts. State minimum-price laws are outlawed for the future.

There are many other unpleasant and onerous provisions. Producers are finding plenty to complain about. But some of their objections are based on misinterpretations of the bill. And still other provisions, while they look bad now, could, by interpretation, prove of benefit to producers.

IN RETURN, producers get many important things they desperately need. The list is impressive. It includes:

- Removal from certificate, reporting, and all other regulations except a limited price control.
- Recognition that producers are not public utilities.
- Prohibition of considering cost formulas in setting prices.
- No price control at all on field sales to local gatherers or gasoline plants which later sell in interstate commerce.
- An end to control over specific prices in existing contracts, including fixed escalation.
- Operation of indefinite escalation clauses up to the reasonable market price.
- Only a one-shot initial examination of new contracts by FPC.
- Gas freed of dedication if a new contract is disapproved.
- Certain types of escalation permitted in new contracts, limited to the reasonable market price when they are invoked.
- Dismissal of most cases pending before FPC.

THIS IS FAR SHORT of what producers want, of course. They can try for amendments, but if they fail they should settle for this as being far better than what they have now.

For what they have now will get worse. Once utility-type regulation gets embedded in the industry it can never be uprooted. Price regulation based on costs will ruin all but the most favored producers. It will lead to regulation of producers' capital. Worse, it will lead to regulation of the price of oil produced by gas producers.

The bill is a hard bargain, but not entirely one-sided. The insiders have good reasons to believe it's the best deal that can be made now or in the next several years. In view of all this, producers had better pay the ransom and get out of bondage as quickly as possible.

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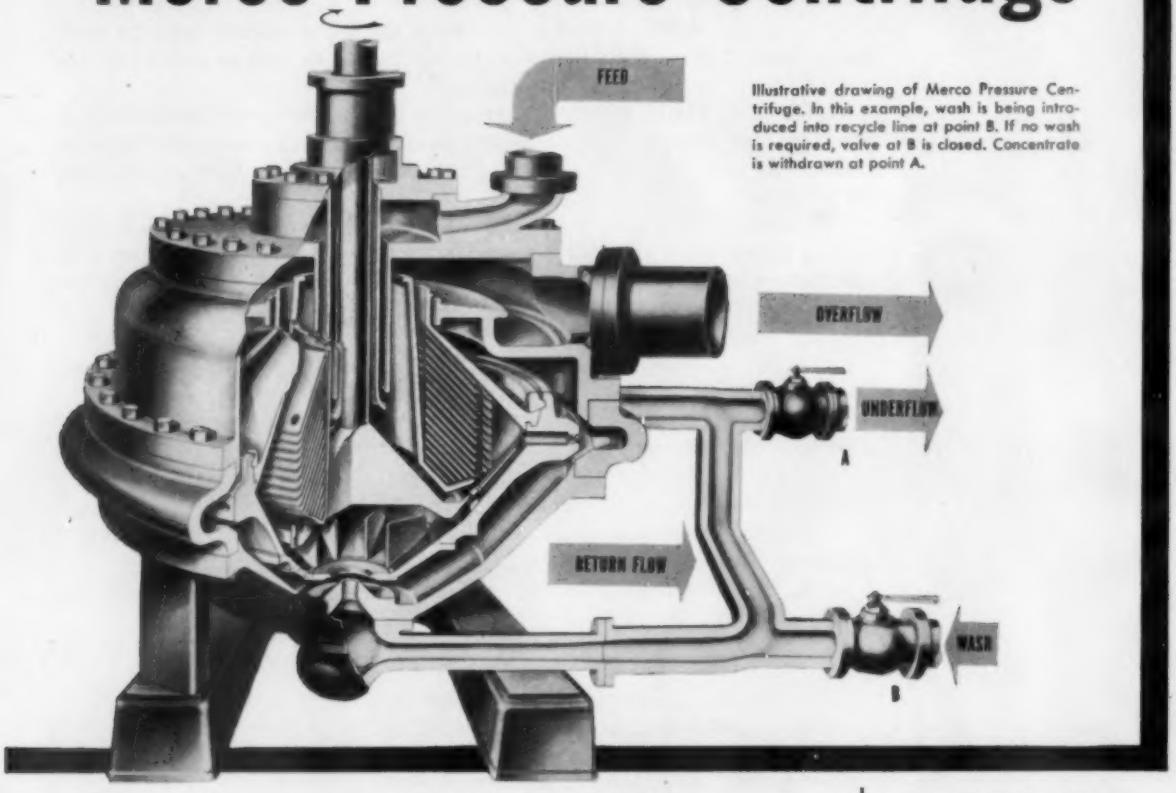

Illustrative drawing of Merco Pressure Centrifuge. In this example, wash is being introduced into recycle line at point B. If no wash is required, valve at B is closed. Concentrate is withdrawn at point A.

Newest development in wet processing equipment, the Merco Pressure Centrifuge is designed for all continuous centrifuging applications at pressures up to 110 psi. Key to pressure operation is a specially designed housing closure that has been exhaustively tested at pressures two to three times the guaranteed figure of 110 psi. Equally important, this new unit incorporates the unique Merco "Return Flow" principle for maximum operating flexibility. Under centrifugal forces thousands of times higher than gravity, even the smallest particles in the feed "sink" rapidly outward and are continuously expelled through fixed open nozzles in the rotor. A controlled portion is withdrawn as finished concentrate and the remainder becomes a return flow to the rotor. Wash, if desired, is introduced to the return flow line . . . clear, excess liquor overflows out the top of the unit.

If there's a step in your flowsheet involving concentration, washing, clarification, soluble recovery, or classification *under pressure*, there is a good chance that this new tool will prove useful. Bulletin No. 2600, just off the press, describes the Merco Pressure Centrifuge in detail. For your copy, write Dorr-Oliver Incorporated, Stamford, Conn.

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Pressure Operation — Concentration, washing, clarification, soluble recovery or classification can be carried out under pressure.

No Solids Build-up — All solids entering the unit are continuously discharged. Return flow flushes solid material at periphery of rotor.

No Nozzle Clogging — Return flow principle permits nozzle flow 2 to 10 times as great as the underflow actually withdrawn. Merco nozzles will discharge particles as large as 1/32 inch.

Practical Design — All separating conditions are controlled externally. The unit is equipped with a sturdy housing which has been X-rayed and hydrostatically tested.

the OIL AND GAS JOURNAL

May 6, 1957

Can Gray Win New Importers?

● Washington is betting the old hands at importing game will promise to cooperate. The real problem in current personal huddles is to persuade those who started since 1954 to slice imports. So independents withhold fire until results are in.

WASHINGTON.—Mobilization Director Gordon Gray is wasting no time finding out how far major users of foreign crude are willing to go to keep imports in line with government policy.

Gray already has started a new series of personal talks with policy-making officials of major oil companies. He is acting under direction of President Eisenhower. The President asked for one last effort to get a voluntary agreement on imports. Failure will set machinery in motion to impose formal controls.

Gray is talking to each company separately. In this way, he explains, the Government and the companies will avoid being put in the position of infringing on the antitrust laws.

How long? . . . There's no official guess how long it will take Gray to go through the list and tot up the results.

The best estimate is that the job will take several weeks. Then, presumably, if import plans are not cut enough the first time round, Gray will go back for further talks.

Gray has indicated most of the talks will be on a person-to-person basis. He believes it will be difficult to carry out the President's directive by letter or telephone.

The feeling in Washington is that Gray will succeed in getting cooperation of companies that have been importing oil over a period of years.

The difficulty will arise in getting promises of cuts by companies who have started importing since 1954. Since that time new refineries have been built on the East Coast. They have been designed to operate on imported crude. The competitive situation would make it difficult for them to use more expensive domestic crude.

Congress sidelined . . . The upshot of Gray's action in sending the import problem to the White House is delaying any real effort in Congress to get quota legislation this year.

The results of the investigation Eisenhower said he will order will not be known for several months. Congress, at best, will be near adjournment before any decision could be made by the White House.

Domestic producers, meanwhile, are watching with interest to see how the promised probe will be made—and by whom.

Gray's own guess is that the President will go outside government ranks to get men for the study. He also has indicated he does not think public hearings can add anything learned at hearings held last fall by former Mobilization Director Arthur S. Flemming. This could indicate the Eisenhower hearing will be limited to facts on domestic production, past imports, and new schedules of importers.

The steps . . . The net result of these efforts will be two reports to the President.

One report on his investigation will show whether Gray's finding that imports threaten national security is well founded. The other, from Gray, will show whether importers are willing voluntarily to keep within the formula set up by the cabinet fuels committee.

On the basis of these reports Eisenhower must make two and perhaps three decisions on these questions:

. . . Is action necessary to keep imports down?

. . . Is voluntary control feasible?

. . . If action is needed, what official form of control is best?

Independents pleased . . . Complete satisfaction with administration moves was expressed last week by the Independent Petroleum Association of America at its midyear meeting in Biloxi, Miss.

Association officials assured members they have every reason to believe that some definite limitations will be imposed. They anticipate results in a matter of weeks, not months.

Similar satisfaction was expressed by representatives of more than a dozen state and regional producers' associations. These groups met with I.P.A.A. officials in a closed session following the scheduled program.

Many independents came to Biloxi prepared to demand that Congress enact some new law this session. They had concluded it was hopeless to expect action under the so-called defense amendment.

A bitter fight was anticipated over whether the producers should demand a tariff, a quota system, or some other device. These suggestions were all shelved, but there was general agreement that they will be pushed for action next year unless during the next few months the administration can find a way to control imports.

It was pointed out that the Reciprocal Trade Agreements Act must come up for renewal again in 1958, and that at that time producers should be ready with a specific amendment in case it develops that the defense amendment has not proved effective.

Caution urged . . . Leaders of I.P.A.A. urged their fellows not to embarrass President Eisenhower nor prod him

into speedier action by demanding that he do more than he has done to date.

They explained that in view of the administration's international problem, and its policies with regard to foreign trade, the President's statement is a signal and unexpected victory for domestic producers.

President Robert L. Wood, Midland, read a letter he received in Biloxi from ODM Director Gordon Gray saying:

"As a result of a period of intensive study of the oil-import problem, I am aware of the feeling of urgency on the part of domestic producers and other interested parties regarding an early solution to this problem.

"It is clear also that the importing companies would benefit by a definite understanding as to how much oil they can import into this country. I certainly agree with you also that the necessity of long-range planning of oil-industry operations underscores the desirability of an early solution."

Wood interpreted this as meaning that the President's own investigation—which he explained is required by the law—will be concluded rather quickly and that the administration has some specific plan in mind for curbing imports.

The I.P.A.A. took no action except to adopt a statement prepared by its imports-policy committee. It pledged the association's "full support of this government action to make effective a sound national policy as to oil imports."

Pessimism remains . . . At the closed session of other associations, some representatives were not as optimistic as the I.P.A.A. officials.

Many were inclined to see the ODM action as just another delaying action, or another futile request that importers take voluntary action.

However, they yielded to the I.P.A.A. position of accepting the new development in good faith.

But the discussion made it clear that most producers will work for legislation next year imposing specific quotas on oil imports, possibly in combination with a tariff.

There seemed to be almost no fear that a quota system would bring federal regulation of the domestic industry. The general feeling probably was expressed by Wirt Franklin, Ardmore, Okla., first president of I.P.A.A., who said that it is the importers who are spreading the idea that restrictions on imports will bring federal control.

Franklin advocated a combination tariff and quota system. The tariff, he said, would make foreign oil pay something toward support of the United States Government but it probably could not be high enough to give domestic producers adequate protection.

A quota system could be imposed on top of a tariff in such a way that it would comprise federal control of importers only and need not affect domestic producers at all, Franklin declared.

Imports picture . . . More detailed figures on past and planned imports than previously given out were released by ODM last week.

They show that imports as reported to the ODM in March would average 1,250,000 bbl. daily in the third quarter of this year and 1,271,000 bbl. daily in the fourth quarter. In the same periods last year they averaged 1,043,000 and 916,000 bbl., the latter figure reflecting the Suez Canal closing.

Imports into District 1 through District 4 were scheduled at 944,000 bbl. daily for the third quarter and 941,000 for the final period. Last year the averages were 831,000 and 719,000 bbl.

District 5 imports will be 306,000 bbl. daily in the third quarter, rising to 330,000 in the following 3 months. Last year they were 212,000 and 198,000 bbl.

The increase in imports over last year will far outstrip the increase in domestic production. Over-all imports in the third quarter will be 207,000 bbl. daily higher than in the same period last year. Domestic production is expected to be only 149,000 bbl. higher. Fourth quarter imports will be 355,000 bbl. higher than last year. Domestic output will be up only 102,000 bbl., it is estimated.

Figures on imports by point of origin show how these increases will be spread out. For the third quarter, presently planned imports from Canada will average 199,000 bbl. daily against 118,000 last year; Venezuela, 566,000 against 493,000; other Western Hemisphere, 40,000, unchanged; Middle East, 367,000 against 351,000, and Far East, 78,000 against 41,000.

In the fourth quarter imports from Canada will average 216,000 bbl. daily against 145,000 bbl. last year; Venezuela, 549,000 against 481,000; other Western Hemisphere, 41,000 against 39,000; Middle East, 376,000 against 202,000, and Far East, 89,000 against 49,000.

Centrifugal Pumper: Dowell Incorporated puts its new Double-Allison centrifugal unit through first field tests during fracturing of a Kearny County, Kansas, gas well. Through 4-in. pipe, it pumped 41 bbl. of water per minute at 1,000 psi. In pilot tests at lower pressures, efficiency of the high-volume, low-pressure unit reached about 85 per cent. At 850 psi., it pumped 80 bbl. of water per minute. The pumper doesn't sand—at least, not yet. It is used in connection with conventional units that do that job. Maximum pressure rating is 2,100 psi. The unit, with two V-1710 modified Allison aircraft engines, registered 1,208 hydraulic horsepower at the pumps on the Kansas job.

Automation Is Inevitable

Management has no choice—so it's better to plan now and avoid headaches sure to come, Conoco executive warns

NORMAN, Okla.—Industry has no choice but to rely more heavily on automatic-control machines. It will be forced into this position by a growing population that will be made up largely of either people too old or young to be in the labor force.

That's the estimate of Harold Osborn, vice president of Continental Oil Co. He was one of the featured speakers at the second annual conference on automatic control sponsored by the University of Oklahoma.

Osborn explained the economic outlook this way: In the next decade the percentage of persons under 19 and those 65 and over will expand. By then these groups will represent nearly half the population. That means that the labor force will represent a smaller percentage of the population.

This labor force will be responsible for producing a greater volume of goods and services for itself and the nonworking half of the nation. The only way it can achieve this is by working longer hours, using more women in labor, or turning to automatic machines. Osborn said, for obvious reasons, the new machines will be the answer.

Some headaches . . . But management can expect plenty of headaches in the gradual swing to automation.

Osborn pointed to a few:

. . . Short-term unemployment. The automatic controls will displace some workers in the initial phase. Management must devise ways to lessen hardships resulting from such displacement. Failure to do so may result in a whirlwind of labor strife. The long-range outlook, however, is that machines ultimately will mean more employment and a higher standard of living.

. . . Boredom. The operators of the machines will have little to do but push a button, scan a control dial, or listen for warning lights or buzzers. This isn't the kind of work Americans like to do. Osborn said he feared worker morale and efficiency would become a problem for management to counteract.

. . . Effect on small businesses. High investment in automatic-control devices will dictate their use on large quantity units. This means big business enterprise will be required to make the best advantage of the machines. But small business is vocal when hurt and its political power is enormous. Osborn warned that may pose a political problem arising from automation.

Automation in oil . . . Management isn't doing enough now about preparing for these headaches and ushering in the day of automation, he said.

The oil business is far ahead of most other manufacturing and producing enterprises in this respect, he said. The Conoco executive gave this rundown on where oil stands in automation:

"The wholly automatic producing oil field is a reality, and the automatic drilling rig is just around the corner.

"Refineries are automatically controlled to a much greater degree than in many other industries.

"Feed-back mechanisms are being used in the analysis of geophysical data which will lessen materially the time required to find an oil field or to abandon acreage.

"Still we have only scratched the surface of what automation can do."

What to do? . . . Osborn made these suggestions of what management should do to keep abreast of the automation age:

. . . Plan at least 10 years in advance the nature of the business it wishes to carry on.

. . . Undertake extensive, fundamental research on application of electronics.

. . . Assign a special group within the company to keep abreast of developments made by companies designing and making automatic-control instruments.

. . . Prepare to make sizable expenditures for experiments on a pilot-plant scale.

Osborn declared only through these steps will the machines be ready by the time they are needed.

P.G.&E.'s 34-in. Loop Climbs a Hill

MENDOTA, Calif.—Pacific Gas & Electric Co.'s 34-in. loop line climbs a hill in the rolling wasteland just south of Mendota in Central California.

The Midwestern Constructors, Inc., spread shown here is working on the 502-mile main transmission line from Topock, Ariz., on the California border, to Milpitas, near San Francisco. Three big tractors are ready to start lowering the pipe in, and a fourth machine in the background will follow closely to perform the backfilling job.

When the remaining 138 miles of single 34-in. line are looped, P.G.&E. will be able to take a total of 1,250,000,000 cu. ft. daily from El Paso Natural Gas Co. at Topock. This is almost 10 times the original capacity of the 7-year-old pipeline.

INTERVIEW

. . . with Oren Harris, author of the House bill to amend the Natural Gas Act.

How does this year's gas bill compare with those before it? . . . Is it a really good bill? . . . Who really wrote it? . . . Here's an interview with the Arkansas congressman who introduced it. He tells why this one must pass, what the industry can do to help.

Just What Are the Gas Bill's Chances?

Q. Just what, Mr. Harris, are the gas bill's chances?

A. Reasonably good. It depends on what develops.

Q. You've used the term "reasonably good" before. What, specifically, do you mean?

A. Well, the No. 1 question is: How active will the support from the President and industry be?

If the President and his administration give strong, active support to this bill, and if it is supported wholeheartedly by industry, then I think the chances of passage are excellent.

Q. Is the lack of widespread and vocal support from the oil industry good or bad?

A. I would want to put it this way: The fact that the industry generally did not have the provisions of the bill to study and learn what it will do caused some reluctance to jump out and support it. I am hopeful that when they understand the full import, they will give wholehearted and enthusiastic support.

Q. But do you think strong industry support might tend to create opposition in Congress?

A. You might find a few areas like that. But I believe success or failure will depend in a large part on the attitude of industry. Industry support will increase chances of success.

Q. Do you expect any drastic revisions in the bill?

A. If there are any drastic revisions—in either direction—I don't believe the bill will pass.

Q. Is the bill certain to be approved by the House committee?

A. I'm not anxious to speculate on the final judgment of the committee—or of Congress.

But I'll say this: After the President's veto last year, in which he announced to the nation the bill was needed and ought to be passed, we had to be assured this year of his enthusiastic support. Without that (1) I wouldn't have started action and (2) the bill couldn't have succeeded if it were started.

Q. What reaction do you expect from the FPC?

A. I'd prefer the FPC to state its own position. But I have every reason to believe it will support the bill enthusiastically.

Q. How does this year's bill stack up with last year's?

A. The bill that was passed by Congress last year was not as good as the bill that Congress passed in 1950. Any bill we can pass today will not be as good as the bill Congress passed last year.

Q. If you fail this year, what of the future?

A. Hopeless. At least until we get to the point where it would be too late.

Q. What do you mean, "too late"?

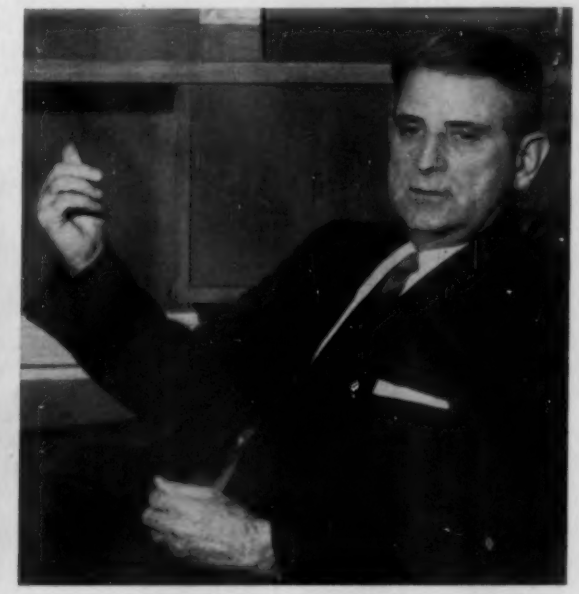
A. If nothing is done the FPC will be compelled to act under the present law. Under the Supreme Court's interpretation, every producer of natural gas is a public utility. Under the law, the FPC has no alternative but to treat him as such. I cannot see any possibility of equitable treatment for the producers.

Now when the FPC gets its rules laid down—to extend to producers the utility-type control it now exercises over transmission lines—it will have to try to administer them.

As a result, exploration will fall off. Competition will not be present any longer. The increase in demand for this premium consumer fuel will decline. The gas industry will go downhill.

You know what happened in Mexico. It's very hard to make a comeback.

If there are any drastic revisions, I don't believe it will pass.



The bill does not contain all the answers but will operate in a fair and just manner.

The time will come ultimately when consumers will yell. Gas will be in short supply; the distributors will have to raise their rates. Then the consumers will be raising cain sure enough.

Then it will be too late.

Q. Where do you expect the strongest opposition?

A. Among some consumer groups, particularly in the Midwest. Also among those who have an honest philosophy that the federal Government should control all resources.

Q. Do you see a trend among congressmen toward more such control?

A. No. There isn't any such trend. But you can't help but notice how results trend in that direction. Congress as a whole is very much in favor of free and competitive enterprise.

Q. Who do you think will support the bill?

A. Large segments of the producing branch of the industry, virtually all of the pipeline-transmission companies, and major segments of the gas-distributing business.

Some are reluctant to support it so far, because of lack of knowledge of what it means, and because it does not contain many of the provisions of last year's bill. The bill does not give all interests everything they want, but I have a feeling they will accept half a loaf as better than no bread and will go along.

Q. How did your bill originate?

A. That's a good query. Some people are saying this is an industry bill. That's only half right.

After the veto last February, it was suggested that the FPC get representatives of the industry together to see what sort of legislation they could agree on. These efforts were largely successful.

A group did work together for many months, with the knowledge of the FPC and with my knowledge, though I did not participate. They finally agreed on a statement of principles, and early last November they called on me and read it to me.

Unknown to this group, I got a copy of this statement of principles. I turned it over to our House of Representatives legislation-drafting service with a request to draft a bill in accordance with it. This involved several weeks and raised a number of questions. I paraphrased these questions in memos to the industry group and received some answers, but they were unable to agree on all points.

By the end of January, I had a proposed draft which followed the industry group's statement of principles in most respects. But it also contained some provisions not agreed to by the industry group but which I thought were necessary.

About the end of January the industry group showed me a draft bill. This would be more acceptable to industry than my bill, but it did not contain some provisions I considered essential in view of the views of the President and the FPC. Nevertheless, I gave it careful consideration in completing my final draft.

Q. Why didn't you introduce the bill immediately?

A. I held the bill for several weeks until I was satisfied it would meet the approval of the White House.

No one else saw the bill except the Speaker of the House and our legislative counsel. I felt I couldn't take the industry into my confidence regarding my activities. That is why the introduction of the bill aroused some surprise in the industry and why some of its provisions were new to those who had been seeking new legislation.

Q. What is the most important feature of your bill?

A. The most important provision is that it frees gas producers from a public-utility status.

The bill does not contain all the answers. It is not entirely satisfactory to everyone. But it provides a new method of regulating producers' pipeline sales that is workable. It will operate in a fair and just manner to

all segments of the industry and to the consuming public, and it relieves the FPC from a staggering regulatory burden.

Q. Do you expect lobbying to have an adverse effect this year?

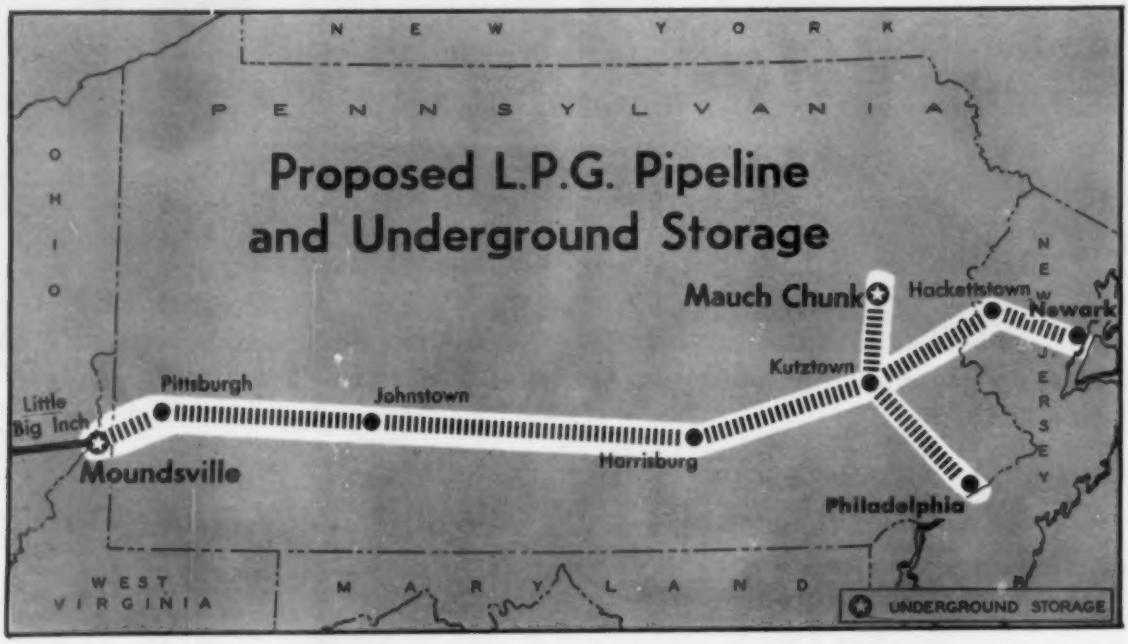
A. I have no scruples about lobbying for this gas bill. Last year it was no different than in many other instances I could cite. If you accepted the theory that was used in vetoing last year's bill, then you could kill ANY bill merely by an uncouth practice.

Q. Do you have any suggestions for the petroleum industry?

A. If I were an oil man, I would make a fighting comeback. I would go to Congress and let it be known that we're in a business that is honorable and vital. After all, the Constitution provides that we may petition Congress for those things we believe in.

I would say that I represent an important segment of the nation's industry that serves with integrity the welfare of our people. I would promote my cause honestly and fearlessly.

I would avoid stupidity and shady actions. I believe that if the industry does its work aboveboard, then Congress will receive it well. And the general public's opinion of the petroleum industry will be considerably improved.



Big Eastern L.P.G. Project Proposed

WASHINGTON.—Conversion of the Little Big Inch from gas to products may lead to construction of an L.P.G. pipeline from Moundsville, W. Va., to Newark, N. J.

The 393-mile, 12-in. line is proposed by Underground Storage & Exploration, Inc., headed by Edward J. Tempest, Upper Darby, Pa., as president. It would take L.P.G. from the Little Big Inch, which Texas Eastern Transmission Corp. proposes to convert from gas to products, and transport it eastward to refinery, petrochemical, and heating markets. The line would have a maximum capacity of 125,000 bbl. daily with six pump stations totaling 7,000 hp. (see map).

There would be 95 miles of 6 and 8-in. laterals to Mauch Chunk, Pa., where storage would be mined out of shale, and to the Marcus Hook refining area near Philadelphia. The company proposes six 200,000-bbl. caverns at Mauch Chunk and 300,000 bbl. in additional storage at Moundsville for a total of 12,300,000 bbl. The storage would cost $35,350,000 and the pipeline $26,025,000.

The Office of Defense Mobilization last week increased the tax writeoff benefits for the project. ODM's new order grants fast tax writeoff for 65 per cent of the total cost. Earlier it approved tax benefits for 50 per cent of the storage and 25 per cent of the pipeline cost. The change was to help offset the risk and high cost of the mined storage, which is the key to economical handling of L.P.G. because of widely fluctuating demand.

FPC hearings . . . Underground Storage's next step depends on the FPC.

Final arguments on converting the Little Inch, a 22-in. line from Beaumont to Moundsville, will start May 9 *(The Oil and Gas Journal, April 29, page 109)*. If the Little Inch switch falls through, the proposed project would be left high and dry. A new source of L.P.G. would be needed.

One possibility would be the products system proposed by American Pipeline Corp. from the Gulf Coast to the East Coast. ODM would like to see the American line built for defense purposes. But financing and other matters make it a question mark at this time.

ODM Director Gordon Gray last week began talks with interested parties on an emergency products line from the Gulf Coast to the East Coast. These talks presumably were with American Pipeline officials.

American Pipeline was approved by former mobilizer Arthur S. Flemming just before he retired in March *(The Oil and Gas Journal, March 25, page 112)*. It would have a capacity of

500,000 bbl. daily of products in peacetime and crude in an emergency.

Treasury approval is needed before American could proceed with plans. Next step would be a certificate of essentiality, making the project eligible for government loan or loan guarantee. For several years, American has had a quick tax writeoff.

The Little Inch conversion is not seen as the greatest hurdle for Underground Storage. The FPC approved it 2 years ago, and recently reiterated that the change back to products service is in the public interest. New hearings were ordered, however, to consider the effect on competing products carriers.

After the FPC decision, Underground Storage faces a big job of lining up sufficient throughput and markets to make the venture attractive enough for private financing.

Market prospects . . . Tempest envisions a substantial increase in the use of L.P.G. in the Northeast if the project goes through. He based this on reduced transportation costs and the availability of ample supplies during periods of peak demand.

He said the East Coast L.P.G. vendors are now paying 13 to 13.5 cents per gallon for L.P.G., of which about 7.5 cents represents transportation costs. Pipeline movement could, it's believed, shave this considerably.

With the large volume of storage to supplement direct shipments, there would be ample supplies available to meet peak needs. This assurance of a continuous supply under even most severe conditions would be expected to encourage more widespread use. There are a number of ready-made outlets for L.P.G. in the Northeast. These include companies now handling bottled gas, gas utilities which would use it for winter peak shaving, oil companies, petrochemical companies, and general industry.

The proposed extension to the Philadelphia-Marcus Hook area would be undertaken primarily to serve the large refineries in that area. There it would be used for blending with gasoline, feed stocks for alkylation, or for petrochemical operations.

One of the factors that contributed to its approval by ODM is the fact that northeastern Pennsylvania is one of the country's distress labor areas. Construction of the storage units would tend to alleviate this condition.

The proposed units would be far greater in size than any comparable undertaking. The principal advantage of the proposed Underground Storage & Exploration system is that it will be close to markets whereas most existing storage is closer to production.

Oil Forecasters See Double

BILOXI, Miss.—The unknown future level of imports is giving forecasters trouble.

The supply-demand committee of the Independent Petroleum Association of America took a look at its figures last week and came up with two forecasts of domestic production—nearly half a million barrels apart—for the last half of this year.

If imports bear the same relation to domestic output as they did in 1954, domestic output will average 7,517,000 bbl. daily, the committee said.

But if imports reach a level indicated in forecasts submitted to the Office of Defense Mobilization in March, domestic production will average only 7,034,000 bbl. daily.

The committee also threw in a third figure—7,484,000 bbl. daily—just in case imports remain at the first-quarter level.

In any event, the committee said, production during the last half will be under the 7,567,000-bbl. estimated average for the first half. This figure was unusually high, due to the emergency oil lift to supply Europe after the Suez Canal shutdown.

By comparison, production in the last half of 1956 averaged 7,138,000 bbl. daily.

Demand is up . . . In revising its earlier forecast, the committee said it now expects total demand this year to increase 5.7 per cent over 1956.

The upward revision was due largely to an unexpected increase of 9.7 per cent in the first quarter. The other three quarters will be below this, it said. The result will be a first-half demand increase of 7.6 per cent and a last-half gain of 3.8 per cent compared with 1956.

For the year, total demand will average 9,707,000 bbl. daily, the committee predicted.

U. S. PETROLEUM SUPPLY AND DEMAND FORECAST

(Thousands of barrels daily, except closing stocks)

	1st Q. 1957*	2nd Q. 1957	3rd Q. 1957	4th Q. 1957	Year 1957	1st Q. 1958
DEMAND:						
Gasoline	3,714	4,275	4,215	3,990	4,050	3,810
Kerosine	486	200	225	425	334	475
Distillate	2,699	1,425	1,285	2,195	1,898	2,705
Residual	1,958	1,515	1,365	1,730	1,640	1,920
Other products	1,856	1,770	1,845	1,670	1,785	1,635
Total	10,713	9,185	8,935	10,010	9,707	10,545
EXPORTS (included above):						
Gasoline	129	95	95	90	102	80
Kerosine	34	10	5	10	15	5
Distillate	238	105	70	65	119	60
Residual	140	85	75	70	92	65
Other products	68	70	75	65	69	65
Crude	326	140	30	30	131	25
Total	935	505	350	330	528	300
DOMESTIC DEMAND	9,778	8,680	8,585	9,680	9,179	10,245
TOTAL STOCK CHANGE	−781	+475	+575	−253	+8	−643
TOTAL NEW SUPPLY REQUIRED	9,932	9,660	9,510	9,757	9,715	9,902
CLOSING STOCKS (million barrels):						
Gasoline	205	179	170	184	184	204
Kerosine	20	29	36	30	30	20
Distillate	76	108	158	134	134	74
Residual	37	42	48	45	45	38
Other products and natural gasoline	117	128	123	119	119	121
Crude	255	267	271	271	271	268
Total	710	753	806	783	783	725
RUNS TO STILLS	8,180	8,051	8,116	8,235	8,144	8,353

*Estimate based on U. S. Bureau of Mines and A.P.I. figures prepared by the Supply and Demand Committee of the Independent Petroleum Association of America.

Gas Bill Wins Friends

● Independents change mind, throw full support behind Harris-O'Hara measure; hearings ready to start on bill

BILOXI, Miss.—The Harris-O'Hara gas bill was endorsed with enthusiasm last week by the I.P.A.A.

Many producers came to the mid-year meeting prepared to express great dissatisfaction with it. Some planned to oppose it.

There was general agreement that the new bill is not as favorable to producers as last year's Harris-Fulbright bill.

But after the association's natural-gas committee made its report and Rep. Oren Harris of Arkansas addressed the group, the association approved a resolution endorsing the bill without a dissenting vote.

This action came as supporters of the gas bill in Washington prepared to kick off first hearings on the measure.

In its report, the committee said: "This legislation is not wholly in accord with our thinking. It does not fully accomplish the objectives that we would like to attain. However, it is a step in the right direction."

The resolution it submitted urged that "all members of the association energetically support its enactment."

Harris told the association that every year that goes by sees a gas bill that is "poorer" for producers

The current bill isn't as good as that passed last year, he said, but it's the best that can be passed this year. If industry fails to get a bill this year, the future looks "hopeless."

The reasoning . . . Opposition among the independents surrendered to arguments of those who have studied the bill's provisions closely and who are familiar with the legislative and political situation in Washington.

The arguments for the bill ran along these lines:

Producers get the most they can expect to have if the bill is to get approval from distributors and others who opposed it last year. It's also the best they can get and still have hopes of support from the administration and enactment by Congress.

The bill has at least a 50-50 chance of becoming law. Any attempt to amend it would be fatal. Further delay will not improve the chances of getting a more favorable bill later on.

Failure to get legislation now will mean that FPC regulation of producers as utilities, and pricing gas on a cost formula will become so deeply imbedded that it cannot be reversed.

Regulation of gas on a cost basis will, eventually, necessitate regulation of the price of oil on a cost basis. Thus, it is better to take this bill now than take the chance of something better later on.

The bill isn't so bad, from the producers' standpoint, as it appears on first reading. As experience is gained under it, practical ways will be found for writing interstate sales contracts which will recognize the realities of the gas business and the need for prices which will give continuing incentives to develop new supplies.

Hearings . . . The House commerce committee will open hearings on the gas bill this week in Washington.

Officials of the FPC and other interested government agencies will be the lead-off witnesses. They are expected to give strong support to the bill. The President already has said the bill is acceptable to him.

With a number of congressmen also wanting to bless the measure, industry witnesses are not expected to be called until late in the week.

A new issue was raised last week when congressmen from the coal-producing states showed signs of waging a fight. They want clauses put into the bill giving the FPC power to ban direct and low-cost sales of gas by interstate pipelines.

Rep. Harley O. Staggers of West Virginia has written a bill to "close the loopholes" in the Harris-O'Hara bill. He is expected to get the support of other members from West Virginia, Pennsylvania, and Kentucky.

The FPC now has no power over direct sales. Staggers charges that the pipeline companies dump gas at below-cost prices between heating seasons. He pointed out that the ban he proposes "falls squarely" within the recommendations of the Paley commission on energy supplies and resources policy.

Stiff opposition to the bill is expected to be offered next week when objectors to the measure will be heard. Philadelphia Mayor Richardson Dilworth, a member of the U. S. mayors' committee on natural gas legislation, has called on 300 mayors throughout the nation to protest the bill. Utility commission officials from a number of states also are expected to oppose it.

Geologists warn Los Angeles . . .

. . . Drilling May Damage Harbor

LOS ANGELES.—Great damage to harbor installations could result from unrestricted production in the Los Angeles Harbor area, a three-man geology committee warned the city last week.

Mayor Norris Poulsen and the city council appointed the committee last month to study the subsidence threat if leases were awarded in the harbor.

In its report to the mayor and city council, the three men recommended the city hire a petroleum engineer as an advisor on all leases entered into by the city.

They also urged the city to set up a board of review to keep a constant check on production on city leases. This board should have the power to halt production immediately when potentially destructive subsidence began.

The committee noted that the inland areas of the city had experienced mild subsidence, a few thousandths of a foot a year, from production over the years. However, the subsurface geology on the inland areas is such that subsidence there is not the threat it is in the harbor.

The committee was composed of U. S. Grant IV, University of California at Los Angeles geology professor, Samuel T. Yuster, petroleum engineering professor at U.C.L.A., and Willard W. Cutler, Jr., consulting geologist.

Los Angeles' Harbor adjoins the Long Beach Harbor, which has experienced multimillion dollars damage from production in the Wilmington field.

The city has applications from various companies and individuals requesting leases on the inner and outer harbor areas inside the main breakwater. It has awarded a lease to the Los Angeles Harbor Oil Development Co. on all city-owned submerged lands outside the breakwater.

At the time the three-man study committee was appointed, the city cancelled plans to lease a 1,350-acre inner harbor parcel to Standard Oil Co. of California and three individuals.

Divorcement Dies

Roosevelt hearings tour dropped at House request

WASHINGTON—There will be no legislation on the marketing practices of the oil industry at this session of Congress.

All chances of action on bills to divorce marketing from refining and otherwise "protect" gasoline retailers faded when the House small business committee last week cut short its hearing tour. Three of the six planned hearings in as many cities were postponed, probably until September.

The subcommittee, headed by Rep. James Roosevelt of California, author of the bills, came back to Washington after a hearing in Chicago.

Previously, it held hearings in Denver and Los Angeles. Its original plan called for additional hearings in St. Louis, Cleveland, and Houston.

The trip was ended on a demand by House leaders that all members get on the job to deal with the now-bogged-down legislative program with an eye to adjournment of Congress early in August.

The subcommittee said its program was suspended, but not canceled. But there was speculation in Washington that Roosevelt's package of bills may never reach the House floor.

His divorce bill was bitterly attacked from all angles of the oil industry, with few speaking in its behalf. It also was opposed by the Justice Department and Federal Trade Commission. The Justice Department raised objections to all but one of the bills in the package.

Alberta Crude Nominations

CALGARY.—Refiners using Alberta crude have submitted nominations totaling 436,745 bbl. daily for May, with 89,848 bbl. going to refineries in the United States.

Imperial Oil, Ltd., was again the biggest purchaser. It nominated 117,039 bbl. daily for refinery use, 47,725 as working stock for export, and 12,000 for Trans Mountain line fill and working stock.

U.S. nominations were Shell Oil Co., Anacortes, Wash., 41,000 bbl. daily; General Petroleum Corp., Ferndale, Wash., 35,561; International Refineries, Inc., Wrenshall, Minn., 8,064; Bay Refining Corp., Bay City, Mich., 4,000; Dow Chemical Co., Midland, Mich., 645; Union Oil Co., Cut Bank, Mont., 255; and West Branch Refineries, West Branch, Mich., 323.

watching WASHINGTON

. . . with Bertram F. Linz

Imports, a real tough nut . . .

THE administration's new look at the oil-import problem won't result in an overnight remedy.

It simply means another study. And another attempt to get the importers to curb their imports.

If Mobilizer Gordon Gray can get the companies to cooperate, the results should become evident in a matter of weeks. But if he can't—and Arthur Flemming spent 2 years trying—it could be several months before the President's study is finished and something new is dreamed up. And that something new may not be government control of imports.

Eisenhower's order to Gray shows that he still favors voluntary controls. He indicated this twice. He directed Gray to approach the importers again. And he said that if his own study confirmed Gray's finding that imports are at a dangerous level, he will want to know if they can be adjusted by voluntary action.

Actually, the administration is in something of a bind. Import control, whether by quota or high tariff, is just the opposite of the Government's policy of freeing international trade. And on top of that, nobody in the Government wants the impossible job of figuring out a quota system that will give a fair break to every friendly producing country and every importer.

Seaton pressing for processing . . .

HAWAII may have its first oil refinery in the not distant future. That is, it may have it if the Defense Department gives up some of the land it is holding for military use.

Island interests have been trying for a couple of years to get two-thirds of the 300-acre Sand Island in Honolulu Harbor back from the Army. If they succeed, the land will be offered for competitive leasing in the hope an oil company will build a refinery. And at least one is interested.

Interior Secretary Fred A. Seaton and Anthony T. Lausi, director of the office of territories, were in Hawaii recently. They see a refinery as a big aid to the territory's economy.

Seaton's support opens the way for talks between Interior and the Defense Department. Interior will press the idea that a refinery in the Honolulu area would be of great benefit to the national defense.

No time for a crisis . . .

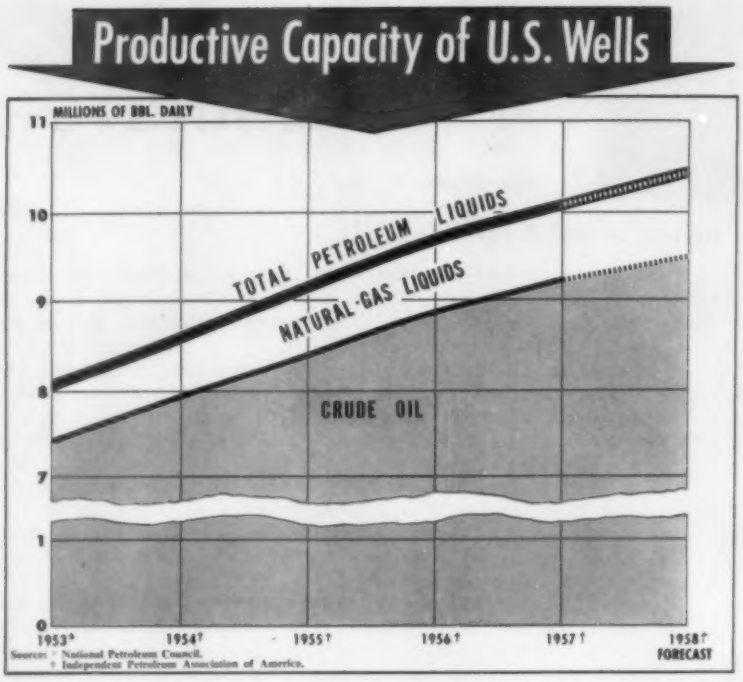
WITH an eye to politically valuable tax reductions, the House is cutting the President's budget all along the line. And in doing so it threatens to shoot the mobilization program to pieces.

Here is what is happening. The House doesn't want to cut any vital items. So in looking around it jumped on the mobilization funds for the agencies having a part in that program. It refused to let the Interstate Commerce Commission spend any money on war planning. And it cut out all money asked for industry divisions of the Commerce Department.

The oil industry has a big stake in this. One of the industry divisions devotes itself to mapping out what oil would need to keep going in an emergency. And if the emergency developed it would have the job of seeing that the industry got what it needed.

The trouble appears to center in the belief of many congressmen that the Office of Defense Mobilization handles the whole mobilization program and the agency work is a duplication. That is not so. The ODM is a small agency. It has farmed out most of its work. And for budgetary reasons each agency asks for the money for its piece of the job.

The Senate probably will put back much of the money the House cuts out. But next year ODM will probably ask for a lump sum, which can be more easily defended, and parcel it out to the delegate agencies.



A 350,000 bbl. daily gain as . . .

Capacity Shows Steady Climb

BILOXI, Miss.—The nation's capacity to produce petroleum is still maintaining a steady upward trend.

The domestic oil industry can produce 10,100,000 bbl. daily this year. This is about 350,000 bbl. daily or 3.5 per cent more than at this time last year. The trend will move upward during the year to a capacity of 10,420,000 bbl. daily by January 1, 1958.

That was the report of the productive-capacity committee of I.P.A.A. at the group's midyear meeting here last week. Committee members attributed the modest growth trend to two factors:

. . . Exploration and development activity in the industry.

. . . Continuing technical advances in producing and recovery methods.

The committee also warned that its forecast of productive capacity for 1958 was based on stable economic conditions. Outside economic factors affect the volume of production, unit prices, and flow of funds into finding and developing domestic petroleum reserves, the report said.

The report also noted two other interesting factors. It showed the U. S. oil industry:

. . . Is not using all its capacity. For instance, in January with a capacity of 10,100,000 bbl. daily, actual production only totaled 8,307,000 bbl. daily. This gives a margin of 1,793,000 bbl. daily or about 18 per cent.

. . . Is increasing productive capacity of crude and natural-gas liquids at about the same ratio. In 1956, crude-oil capacity was 8,929,000 bbl. daily and natural-gas liquids 825,000 bbl. daily. For 1957 the figures were 9,250,000 bbl. of crude and 850,000 bbl. of liquids. The forecast for 1958 shows 9,545,000 bbl. of crude and 875,000 bbl. of liquids.

Committee members participating in the study were J. P. Coleman, Wichita Falls, Tex., chairman; P. R. Schultz, Tulsa, vice chairman; Minor S. Jameson, Washington, secretary; Stark Fox, Los Angeles; Maury Goodin, Denver; R. A. Hendricks, Bartlesville; Walter N. Kellogg, A. I. Levorsen, and H. A. Nedom, of Tulsa; Duncan Patty, Oklahoma City; E. A. Jenkins and Everett G. Trostel, Dallas.

Pollution Order Upheld

MOUNT PLEASANT, Tex. — Operators in two big northeast Texas oil fields have the Texas Railroad Commission's final word on salt-water pollution: Stop it, or see pipeline connections severed.

The two fields are Talco and Pewitt Ranch of Titus and Franklin counties. A commission investigation late last year disclosed operators in these fields were running 10,000 to 15,000 bbl. of salt water daily into White Oak Creek, the Sulphur River, and Texarkana Reservoir.

The commission in January ordered Talco and Pewitt Ranch operators to stop storing salt water in surface pits and start injecting it into underground formations not productive of fresh water. The operators sought and were granted an April hearing on the matter.

The commission heard nothing at the hearing to change its feelings. Talco operators must be injecting all produced salt water by October 1, and Pewitt Ranch producers by August 1.

Big Growth Ahead

Gulf official says world demand may double by '75

CLEVELAND.—World demand for petroleum products will increase at least 80 per cent and could well double over the next 20 years. This will mean consumption of 28 to 32 million barrels daily by 1975.

This tremendous growth from the present demand of little more than 15 million barrels daily was predicted by William L. Naylor, senior vice president of Gulf Oil Corp. He made the estimate in a speech before the Cleveland Security Analysts Society.

Naylor said this dynamic growth trend has been set in free-world oil since 1938 when consumption was only about 5 million barrels daily. Naylor noted that demand has trebled since then and added: "Certainly over the next 20 years, it is difficult to see how world demand will increase less than 80 per cent and could well double."

The Gulf official declared that while the world consumption trend has been upward the trend of U. S. oil reserves has been downward. In 1920 the U. S. enjoyed reserves equivalent to 15.8 years of consumption at the rate maintained then. By the end of 1956, proved reserves were equivalent to only 11.3 years of supply at 1956 consumption rates.

He said this means: "We must supplement domestic output with more oil from abroad if we are to protect and produce our reserves in line with the best natural resource conservation practices." He added, "We certainly want no flood of . . . foreign oil but imports in amounts necessary to assure an adequate supply at reasonable prices."

Ethyl Takes in Third Grades

THE April gasoline survey compiled by Ethyl Corp. shows some added features.

For the first time, information on 27 samples of third-grade premium gasoline from 15 cities is included. The basic survey also has been expanded to include 57 rather than 53 cities.

The April survey shows the research octane rating of premium increased 0.2 octane number over March while regular increased 0.1 octane number over March. All national averages are weighted on gallonage and are obtained from about 1,000 samples collected from coast to coast. The April averages, compared with April 1956, show increases of 1.4 R.O.N. for premium and 1.3 R.O.N. for regular.

Not included in the averages, but listed separately, were test results on the 27 third-grade samples which were taken only in cities where two or more brands of third grade were sold. These cities were not identified, but they are primarily along the East and Gulf coasts. The survey represents samples of all companies now marketing third grade.

In this compilation, research octanes ranged from 100.0 to 101.6 with an arithmetical average of 100.7 for the 27 samples. Motor octane numbers ranged from 89.0 to 92.4, with an average of 90.4. Tetraethyl lead ranged from 2.28 to 3.03 ml. per gallon, averaging 2.76.

In a breakdown, one sample rated 100.0 R.O.N., two tested 100.2, two tested 100.3, and three were 100.4. Five samples were at the 100.6 level, two at 100.7, three at 100.8 and four at 100.9. The remaining five samples were 101.2, 101.3, and 101.4, 101.5, and 101.6.

In the basic compilation covering only two grades, the movement toward the 100 R.O.N. figure is becoming more evident in premium sales. Two of the 479 premium samples rated 100.6 and 101.1. In the 99.0 to 99.9 range were a total of 83 samples.

The four cities added in April include Des Moines and Davenport, Iowa; Midland, Tex., and Newark, N. J. Newark was formerly grouped with New York.

In April, Baltimore showed the highest premium average, at 98.9 R.O.N., while Billings, Mont., showed the lowest at 94.2. Regular-grade averages ran highest in Hartford with 92.9, and lowest in Salt Lake City with 83.6.

A breakdown of cities on the April survey, compared with ratings 1 month and 1 year ago, follows:

PREMIUM

(Cities per octane group)

Group—	Apr. 1957	Mar. 1957	Apr. 1956
91-91.9	0	0	1
92-92.9	0	0	1
93-93.9	0	0	2
94-94.9	3	4	10
95-95.9	1	0	12
96-96.9	14	18	15
97-97.9	13	14	15
98-98.9	26	20	0
Total cities	57	56	56
Weighted avg. R.O.N.	97.7	97.5	96.3
Weighted avg. TEL, ml./gal.	2.53	2.52	2.51

REGULAR

(Cities per octane group)

Group—	Apr. 1957	Mar. 1957	Apr. 1956
81-81.9	0	0	1
82-82.9	0	0	0
83-83.9	1	1	1
84-84.9	0	0	0
85-85.9	1	1	1
86-86.9	3	3	20
87-87.9	5	8	1
88-88.9	12	9	7
89-89.9	13	11	9
90-90.9	2	6	4
91-91.9	9	7	11
92-92.9	11	9	1
93-93.9	0	1	0
Total cities	57	56	56
Weighted avg. R.O.N.	90.6	90.5	89.3
Weighted avg. TEL, ml./gal.	2.03	2.00	2.26

Natural Gasoline Price Dips

Grade 26-70 natural gasoline dropped to 3.5 cents a gallon on the North Texas market May 1. This is the third time natural has fallen this low since 1946.

During March 1950, North Texas natural was down to 3.5 cents a gallon and again for two short periods in 1954. These were April 4-30 and July 20-August 2.

Since motor-fuel prices are higher now than during either 1950 or 1954, the ratio of natural-gasoline price to regular motor-gasoline price is the lowest since 1946.

For example, the new Grade 26-70 natural price in North Texas is slightly less than 30 per cent of the low refinery price for Group 3 regular motor gasoline. In 1950, the low natural price was 37.3 per cent of Group 3 regular. The ratios for the two periods in 1954 were 32.6 per cent and 33.3 per cent.

City Drilling Sought

Richfield gets first nod to drill in Los Angeles

LOS ANGELES.—Richfield Oil Corp. cleared a major hurdle in its plans to conduct drilling operations on 550 acres of highly developed residential property in Los Angeles' Silverlake district.

The City Planning Commission tentatively approved Richfield's application to set up a drilling district in that neighborhood. But the city council must also approve the application. The commission is withholding its recommendation to the council until Richfield designates specific drill sites.

Richfield's application includes a petition signed by more than 74 per cent of the property owners favoring drilling in their neighborhood.

Other applicants . . . Two other petitions for drilling permits in metropolitan Los Angeles are pending before the planning commission.

Burke-Bauman Co. wants authority to set up a drilling district on 123 acres within a mile of city hall. The Burke-Bauman acreage includes portions of the old Los Angeles field.

The other application, filed by Nordon Corp., Ltd., asks for a drilling district in downtown Hollywood. The planning commission will hold hearings on both petitions this week.

Gulf Silent on Deep Wildcat

PECOS, Tex.—Gulf Oil Corp. was drilling ahead in chert last week at its 1. P. G. Northrup, deep test in Reeves County, West Texas, after testing an open-hole interval between 18,417-18,709 ft.

Gulf refused to give out results of the test, but reliable reports had it that only mud was swabbed into pits during the test. The test was run after operator pulled several chert cores.

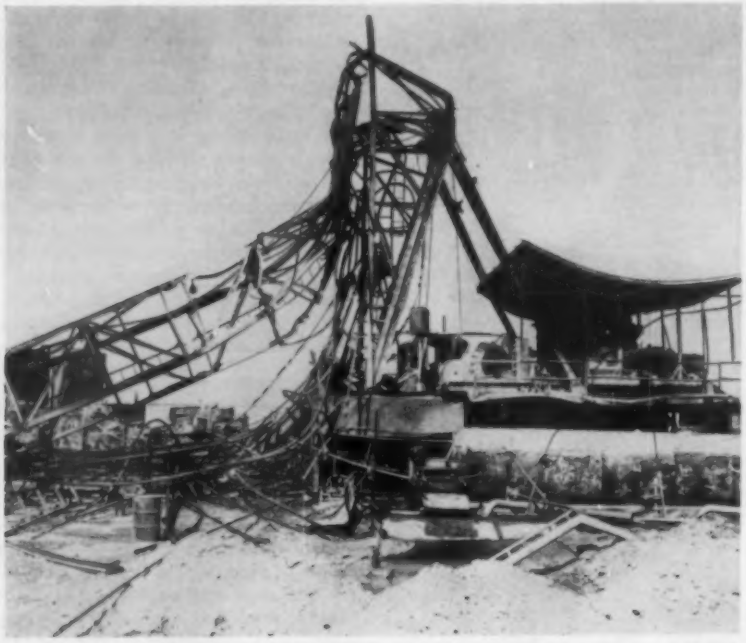
The 1 Northrup, 23 miles southeast of Pecos, is West Texas' deepest hole. Projected total depth is 19,200 ft. where the operator hopes to take a look at the Siluro Devonian.

The wildcat holds the undisputed title of the oldest, and one of the meanest and most difficult now drilling. It was spudded in January 1952 and has been plagued continuously with trouble. The hole was abandoned and reentered three times and sidetracked a like number.

If it reaches the projected 19,200-ft. depth, the well will displace a test drilled by Magnolia Petroleum Co. in 1955 as the state's deepest.

Freakish "Automation" Kills Wild Well

Oil trapped inside cylinders of blowout preventer heats up and expands, forcing rams to close and shut off flow



BLOWOUT: This is part of the $1-million damage from flames sweeping through the well which blew out during fracturing in the San Juan basin.

KILLER: Heat-pressure combination closed this preventer, killing well automatically. From left are Herman King, King Drilling, and Art Byrd, Phillips.

FARMINGTON, N. M.—A persistent blowout preventer has been credited with saving a wild oil well which was killed by freakish delayed action after it had burned out of control for several hours.

Investigation of the million-dollar accident disclosed that heat from the burning well apparently triggered the blowout preventer automatically shutting off the flow and bringing the well under control.

A spokesman for Cameron Iron Works, Inc., manufacturer of the blowout preventer, said it was the first time he had ever known of heat and well pressure combining forces to kill a well automatically after it had blown out.

The well is Phillips Petroleum Co. 3 Hospah, about 25 miles south of Farmington. It blew out and burst into flames April 15 when a connection broke while the well was being sand fractured. Hot oil sprayed over the entire area in a sheet of flame, making it impossible for the operator to activate the preventer.

Oil shooting from the wellhead ignited and burned more than 2 hours before the well died. The rig, operated by King Drilling Co., crumpled under the intense heat. At least 13 trucks and automobiles also were demolished.

How it worked . . . Early reports indicated the well had burned itself out when it gradually stopped flowing. However, after the charred equipment had cooled, workmen discovered that the blowout preventer had closed itself by natural forces.

The side of the hydraulic cylinders which opens the preventer was open to atmospheric pressure. Oil in the closing side was trapped inside the cylinder. As the flames heated this trapped oil, it expanded and forced the rams together.

Once the rams began to close, pressure from the well was partially diverted to the rear side of the rams. The well pressure apparently helped complete and maintain the seal inside the casing.

The blowout preventer was left on the well, keeping it closed in. After that, other equipment was moved in so that mud could be pumped through the Flex-Seal valve in order to kill the well.

The "frac" crew lacked only a few minutes of finishing their job when the accident occurred. The well was reported in production within 10 days after it was brought under control.

Expansion Delayed

● Pacific Northwest slows move toward integration, but refinery deal pending

SALT LAKE CITY.—Plans of Pacific Northwest Pipeline Corp. to build a crude and products pipeline and expand into refining appear to be up in the air for the time being.

The company, now a subsidiary of El Paso Natural Gas Co. as a result of a recent stock transaction, had announced plans to become an integrated oil company *(The Oil and Gas Journal, September 24, 1956, page 99)*.

Northwest Production Corp., a subsidiary of Pacific Northwest, and Western States Refining Co. directors announced plans for a merger under which Northwest Production would get small refineries at North Salt Lake and Farmington, N. M. The merger has not been completed, although announced 8 months ago.

In reply to industry reports that it was off, an El Paso executive said the merger "is still pending."

Northwest Pipeline Corp., a subsidiary of the producing company, was scheduled to start this month on 350-mile, 8 and 10-in. crude and raw products line from Ignacio, Colo., to the Salt Lake City refining center. Reports have circulated that this project was dead. Two groups of major companies will have 16-in. crude lines out of the Four Corners area (Colorado, Utah, New Mexico, Arizona) by next year. *(The Oil and Gas Journal, February 11, page 74)*.

The Northwest Pipeline plans apparently have been delayed, although pipe is available. But a company spokesman says: "No, Northwest Production Corp. has not yet abandoned plans to construct a products pipeline from the Four Corners area to Salt Lake City."

The original plan was to commingle crude and raw products from Pacific Northwest's big Ignacio natural-gasoline plant in the line to Salt Lake City. Even if crude output from the fast-growing area is taken care of by lines to be built to Los Angeles and Jal, N. M., large volumes of natural-gas liquids will still have to be disposed of.

Decisions on the projects are expected to jell when they are studied in light of El Paso's integration plans. El Paso officials recently moved into top jobs of the Pacific Northwest affiliates as a result of a stock exchange which gave El Paso 99 per cent ownership in the company.

Processing Briefs

Standard Oil Co. of California has set up a new company to consolidate its expanding chemical interests. California Chemical Co., the new firm, will coordinate activities of two subsidiaries, California Spray-Chemical Corp., and Oronite Chemical Co.

California Chemical Co. also will handle long-range planning of Socal's chemical activities. G. L. Parkhurst is chairman of the new company and P. L. Fahrney is president. Both are vice presidents of Socal. T. H. Hughes, president of Oronite, and A. W. Mohr, president of Cal-Spray, were named vice presidents of California Chemical.

Standard Oil Co. (Ind.) is completing a new lube plant at its Casper, Wyo., refinery. The first such installation built in several years, it comprises a 4,800-bbl. per day vacuum pipe still, a 1,000-bbl. propane deasphalting unit, a 1,500-bbl. furfural unit, and a 2,000-bbl. methylethyl ketone unit for dual deoiling and dewaxing service. The plant boosts Casper's capacity for finished lubes from 650 to 1,030 bbl. per day. Foster Wheeler Corp. of New York was general contractor.

Esso Standard Oil Co. is using the "preloading" method in preparing foundations for three 150,000-bbl. storage tanks at Bayonne, N. J. The storage site is soft organic soil. Instead of driving piling for tank foundations, engineers have raised 25-ft. mounds of sand and chrome ore on the tank sites. These mounds will remain in place for nearly a year. Their weight will compact the soil sufficiently to stand the weight of the tanks.

Delhi-Taylor Oil Corp. will put its $4,000,000 petrochemicals plant at Corpus Christi, Tex., on stream about July 1. The Udex extraction unit has a capacity of 45,000,000 gal. per year. Initial production will include benzine, toluene, and xylene. Additional petrochemicals may be added later.

Champlin Oil & Refining Co. of Fort Worth has let a construction contract for a 1,400-bbl. Phillips Hydrofluoric acid alkylation unit at its 31,000-bbl. Enid, Okla., refinery. Badger Manufacturing Co. of Cambridge, Mass., will install the unit. Completion is expected in March 1958.

Four new units at the Kerr-McGee Oil Industries, Inc., refinery at Wynnewood, Okla., will be installed by Refinery Engineering Co. of Tulsa. The $4-million project includes a 7,350-bbl. naphtha prefractionator, a 5,500-bbl. naphtha Unifining unit, a 5,500-bbl. Platformer, and a 4,000-bbl. distillate Unifining unit. The Platformer and Unifining units are licensed by Universal Oil Products Co.

Spencer Chemical Co. is doubling capacity at its high-pressure polyethylene facilities at Orange, Tex. The new program, which will push production from 45 million to 90 million pounds a year, will be completed within a year.

Also for Refiners . . .

Gordon Gray has started his talks with major importers. His problem will be to persuade the new importers to cooperate (P. 75) . . . Conoco's Harold Osborn says management has no choice but to rely heavily on automatic controls (P. 77) . . . Big L.P.G. line is being talked for the East. It would link eastern refineries with converted Little Big Inch (P. 80) . . . Imports enigma is giving supply-demand forecasters trouble in reporting for the last half of year (P. 81) . . . Legislation on marketing practices of oil industry appears dead this session of Congress (P. 83) . . . Gulf official predicts world demand will double by 1975 (P. 84) . . . Ethyl survey gives first reports on octane ratings of superpremium gasolines (P. 85) . . . Plans of Pacific Northwest Pipeline to expand into refining appear up in the air following firm's merger with El Paso Natural Gas (P. 87) . . . Muskegon, Mich., refineries will be served by new crude line (P. 91) . . . Goodyear is betting on a real synthetic-rubber boom by expanding its Houston plant (P. 92) . . . Shell plans West Germany's largest refinery as part of $170-million construction program for next 4 years. Swiss interests also plan a refinery at Emden, West Germany (P. 96).

PLUS THESE TECHNICAL FEATURES: Automatic rating of fractionators, an outline of major steps in a practical program for plate-to-plate computations on a medium-speed computer (P. 103) . . . Nelson Cost Index (P. 136) . . . The Foreman's Page (P. 139) . . . PETROdatics (P. 141) . . . Cost-imating (P. 143) . . . and Questions on Technology (P. 145).

PR Gets a Push

● I.P.A.A. approves expanded "grass roots" program; Speaker says it must be a man-to-man attack on ignorance

BILOXI, Miss.—Oil-industry public relations, a matter of general concern since the Washington investigations started, got more impetus last week.

The Independent Petroleum Association of America voted to expand its staff and undertake a long-range program to attack the basic problem of public ignorance of the oil industry and its problems.

The decision followed an address by Henry D. Ralph, chief editorial writer of The Oil and Gas Journal, entitled "Advice to the Lovelorn."

In his talk Ralph told the independents they, as individuals, must solve the problem by explaining oil's problems to their newspaper editors, ministers, neighbors, and milkmen.

The new I.P.A.A. program calls for a top-level speakers bureau for major addresses, a state and local bureau for talks before smaller groups, a visitation program in which oil men would call on newspaper editors and other opinion-influencing persons, preparation of easy-to-read material for wide distribution, and concerted action to educate oil-industry employes and stockholders, and others affiliated with the industry.

What Ralph said . . . Ralph told the independents that as oil men they live in a goldfish bowl.

If oil men are to eliminate the public distrust they must remove the secrecy surrounding the industry and let the public see what it is doing and how it is doing it.

He made these suggestions to oil men:

. . . Get out the facts. There has been entirely too much secrecy in the oil business. Many of the misconceptions about the oil industry arose because oil men are afraid to talk—or never learned how. Tell the truth and sell the truth.

. . . Be specific. Don't go off into vague generalities. It gets you no place to wave the flag, preach the American way of life, and shout that oil is a useful commodity.

. . . Don't harp on the obvious. People aren't as dumb as you may think. Find new things to talk about, and new ways of saying old things.

. . . Speak out boldly in your own defense when unfairly attacked. You must be nice to people most of the time, but you can't win a battle by being nice to the enemy. There are times when you have to fight for things in this life. And people admire a good fighter.

. . . When you have to fight back, do it promptly. Get in your licks while the other fellow is swinging.

"If you go home and train for a couple of weeks and then come back to do battle, you may find out the other fellow has walked off with your girl," Ralph said.

"One trouble with public relations," Ralph said, "is that the term is used to cover many different things. The subject gets all tangled up with publicity, with merchandising, with advertising, with press relations, with community relations, with customer relations, with employe relations, and many other things."

All these, he continued, are parts of public relations—but they are not the real "heart and soul" of it. What is it, then?

"It's no more than how you get along with the public and what the public thinks of you. It's that simple."

The right way . . . Oil's problem is selling oil, the industry, not oil the commodity, Ralph said. People are already happy with the product. They are not so happy with the people who make it.

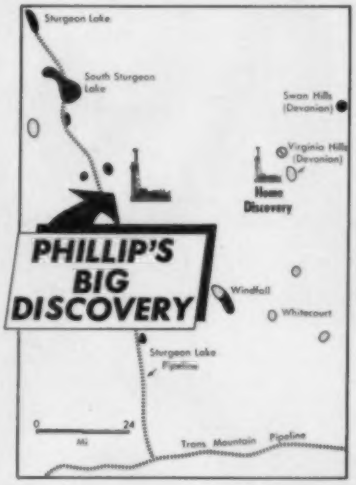
Public relations, Ralph warned, must have the personal touch before it will become effective. Public relations programs can point the way, but publicity must be backed up with a "people to people" program to have lasting effects.

The program should be an "each one teach one" affair, with every member of the industry convincing at least one person that oil men are good.

One of the best ways to do this, Ralph said, is to keep a blanket over intra-industry squabbles, but come out fighting when the enemy attacks any segment of the industry in any part of the country. If the enemy wins against one part of the industry "you might be the next victim."

The trick to winning "the fair lady—public opinion," Ralph concludis to "pitch your woo with all the little devices common to the way of a man with a maid.

"First, you've got to be lovable, and then you've got to convince the object of your affections that you really love her and are worthy of her trust. You can't do it with a shotgun. And you can't do it by sending a hired hand to do your courting for you. Speak for yourself, John."



Trend Shaping Up

Prolific Alberta strike just 9 miles from outlet

BARTLESVILLE. — Phillips Petroleum Co. has one of western Canada's most important oil discoveries of the year.

The company's 1 Kaybob, 145 miles northwest of Edmonton in Alberta, flowed oil at a daily rate of 2,350 bbl. through a small choke from 45 ft. of porous reef in the Devonian-Cooking Lake formation on a 2-hour drill-stem test from 9,572-9,625 ft.

The discovery is 35 miles west of Home et al's Virginia Hills Devonian oil discovery in the Slave Point formation. The Phillips well is on a 69,120-acre crown reservation. Phillips will earn an undivided one-third interest in this reservation.

Additional coring indicates a production thickness of at least 70 ft. The well is coring ahead in the Devonian pay zone.

The well is 9 miles from a crude line which connects Sturgeon Lake field with the Trans Mountain pipeline to the Pacific Coast.

The Kaybob discovery appears to be another prolific link in the Virginia Hills-Swan Hills Devonian reef trend shaping up north of the general Windfall-Whitecourt area. This section of Alberta has been the focal point of Canadian exploratory interest this year.

California Vote Due

Assembly is forced to vote on proposed royalty bills

SACRAMENTO. — The state assembly, acting to break a committee deadlock, voted to act immediately on two controversial tideland bills.

The two amendments to the Cunningham-Shell Act had been held up in the assembly committee on manufacturing, oil, and mining, by identical 8 to 8 votes. Neither amendment could gain the necessary majority votes to get it out of committee for the assembly to act on.

Submitted by Assemblymen Joseph Shell and Allen Miller, both amendments would change the royalty rate on wildcat acreage to 16⅔ per cent and a sliding scale beyond that. However, Shell's bill makes the sliding scale feature optional at the discretion of the State Lands Commission. Miller's makes it mandatory.

Giveaway charged . . . The action of the assembly to act directly on the two measures brought charges that Shell's measure is designed to "cheat" the people of California. Miller claims Shell's amendment is an attempt to continue the "giveaway of the state's resources."

Both Assemblymen Bruce F. Allen and Jesse M. Unruh said Shell's measure was "designed to cheat the people out of getting a fair return from tidelands oil production."

"The Miller bill says to the oil industry that thou shalt not steal from the people of California while the Shell bill says thou shalt not steal so much," Unruh said.

Kermac Buys Marketer

OKLAHOMA CITY.—Kerr-McGee Industries, Inc., Oklahoma City, has gained access to 11 refined-products terminals through acquisition of Triangle Refineries, Inc., Houston. The deal is being made through exchange of stock. Consideration was reported in excess of $5 million.

Triangle is one of the largest independent marketers of refined products, selling to other marketers in 15 states from Wisconsin to Florida. The pipeline, river, and deep-water terminals are located in the Midwest and South.

J. B. Saunders, founder of Triangle, will continue as president. Its activities involve the marketing of the entire output of 13 processing plants and refineries under term contracts.

Pipeline briefs

Fish Engineering Corp., Houston, has acquired 80 per cent interest in Arnold Pipe Rental Co., Inc., Corpus Christi.

The acquisition was announced last week as E. P. Arnold, president, revealed plans to expand the company's operations into South Louisiana and offshore. The firm, which rents various oil-field equipment, soon will open an equipment yard and warehouse at Morgan City, La.

Ohio Fuel Gas Co. has awarded a contract to O. R. Burden Construction Corp. to lay 43 miles of 24-in. gas line along its system from Sugar Grove to Utica, Ohio. The contractor started work this week with C. M. Hoffman in charge of construction. The project will be finished about July 1. It is part of a 152-mile program planned by Ohio Fuel this year.

Pacific Northwest Pipeline Corp. has signed up an estimated 50 billion cubic feet of natural-gas reserves owned by Beehive Uranium Co. in western Colorado. Pacific Northwest will take 5,000,000 cu. ft. daily. Beehive will receive 12 cents per M.c.f. at first. The price will escalate every 5 years. The field has not been developed fully. Open-flow potential of existing wells is 37,000,000 cu. ft. daily.

Gibson Crude Oil Purchasing Co., Ltd., expects to complete its 15,000-bbl. daily crude line from Bellshill Lake field, northeastern Alberta, to Interprovincial Pipe Line near Hardisty next month. Throughput will start at 2,500 bbl. daily.

Petrol-Structors, Ltd., Calgary, is designing and supervising construction. The construction contract went to Hutchison Construction, Ltd., Leduc, Alta., which will build 19 miles of 6-in. main line and 6 miles of gathering lines. The pipeline outlet will mean an increase of 30 cents per barrel in the wellhead price of Bellshill Lake crude.

R. H. Fulton & Co. has completed a 102-mile, 34-in. section on El Paso Natural Gas Co.'s main line between Gallup, N. M., and Winslow, Ariz. Fulton has 28 more miles to build on this looping program, but delay in pipe delivery is holding up the job. The spread has been sent to Palmdale, Calif., to work on the 241-mile, 30-in. line for Southern California Gas Co. and Southern Counties Gas Co. from Topock, Ariz., to Newhall, Calif. Another Fulton spread is already at work out of Barstow on this project, which is to be completed June 30.

Total sales of the gas-utility and pipeline industry were 7.6 per cent higher during February than for the same month last year. Natural-gas sales showed a 10 per cent increase for the year ended in February, the American Gas Association reported, noting that sales of manufactured gas dropped 41.7 per cent and mixed-gas sales declined 31.9 per cent.

Also for Pipeliners . . .

Author of the new natural-gas bill says this may be last chance of producers to win measure of freedom from price controls (P. 78) . . . A 393-mile, 12-in. L.P.G. pipeline is proposed to link the converted Little Big Inch with eastern refinery centers (P. 80) . . . Independents have thrown their support behind the Harris-O'Hara gas bill (P. 82) . . . Plans of Pacific Northwest Pipeline to build crude and products pipeline from Four Corners area to Salt Lake City are up in the air (P. 87) . . . ODM is closing out its program for quick tax writeoffs on pipeline projects (P. 90) . . . Service Pipe Line plans venture with Aurora Gasoline on 165-mile, 10-in. crude line from Griffith, Ind., to Muskegon, Mich. (P. 91) . . . Pasotex Pipe Line has completed another link in its 20-in. crude line between Wink and El Paso (P. 92) . . . Shell plans 120-mile pipeline from Cologne-Bonn area to Rotterdam as part of $170-million construction program in West Germany (P. 96) . . . Natural gas in volume is flowing from Lacq gas field in France through new pipeline system (P. 97).

PLUS THESE TECHNICAL FEATURES: A new approach to pipeline-pressure-surge problems, based on 5-year study, is bringing new designs and techniques. First of a two-part article (P. 112) . . . and Pipeline Patrol (P. 150).

Turbodrill Needs Bit

Dresser official thinks turbodrilling has a big future, but says a heaftier bit is needed to make it a success

CASPER, Wyo. — The turbodrill is proving a whiz at drilling hole faster than the rotary. But its tendency also to wear out bits faster is restricting the new drill's economic potential.

This short bit life, in fact, makes officials of Dresser Industries, Inc., cautious in predicting the future use of the turbodrill. They report field tests show encouraging prospects for a tremendous future whenever the proper bit has been developed.

That's the information relayed by Dresser's J. A. Mitchell to oil men attending the spring meeting of the Rocky Mountain district of the A.P.I. Division of Production.

Mitchell declared that field tests in this country of the Russian and French turbodrill have achieved drilling rates sufficient to reduce drilling costs in spite of the bit problem. He pinpointed three early conclusions about the drill:

... **It's a rugged,** powerful downhole motor.

... **It's penetration rates** are from 1½ to 5 times greater than the comparable rotary.

... **Bit footages** are disappointing. They range from 70 per cent of rotary footages for the large-size bits to as low as 30 per cent of rotary for the smaller bits. Greatest need at the moment is for high-speed bits in sizes under 9⅞ in.

Extent of tests . . . Dresser has conducted its turbodrill tests in 12 West Texas oil wells and in one test hole at Dallas.

Much of the oil-well drilling was in hard-rock formations in West Texas. Thus a variety of drilling conditions was encountered, including soft shales, salt, anhydrite, hard lime, chert, and sand and shale. About 10,500 ft. has been cut so far, requiring 87 bits.

Mitchell said in all but a few bit runs penetration rates exceeded those of rotary drilling. Bit footages were low in many runs. But in some cases penetration rates were high enough to offset low bit life and still yield a saving in over-all costs.

Mitchell presented three specific cases to explain how the turbodrill might cut costs even using presently available bits. In making the cost estimates, he included a reasonable charge for the turbodrill, costs of bits, and rig time during drilling and making round trips.

Hard formation . . . Drilling of a 12¼-in. hole through lime, chert, and sand in the Permian basin of West Texas gave the turbodrill a chance to show off under crooked-hole conditions.

Here were the test conditions: To avoid excessive deviation, weight on the bit for turbodrilling first was 45,000 lb. in the upper part of the test and then was reduced to 27,000 lb. In an offset rotary-drilled hole, bit weight was about 60,000 lb.

This practice maintained a 2° deviation in the turbodrilled hole and a 3° deviation in the rotary-drilled hole for the lower 500-ft. interval compared. Other competitive results showed:

... **In one 187-ft. interval** in the upper part of the test, penetration rate of the turbodrill was 3.6 times that of the rotary. Bit footage was 132 per cent of rotary. Cost per foot was 57 per cent less.

... **In a 162-ft. interval** in lower portion of test, turbodrill speed was 2.8 times rotary. Bit footage was 122 per cent of rotary. Cost was 31 per cent less.

... **Over 867-ft. interval,** penetration rate of turbodrill was 2 times rotary. Bit footage averaged 60 per cent of rotary. Cost per foot was 5 per cent less.

Soft formation . . . Another test compared performances of the turbodrill and rotary in drilling 8½-in. hole in relatively soft chalk, sand, and shale.

Twenty turbodrill runs and 12 rotary runs were made.

The turbodrill averaged 38 to 45 ft. per hour and the rotary 14 ft. This was a drilling rate increase of 2.7 to 3 times in favor of the turbodrill. Bit footage for the two was about the same. This resulted in a 20 per cent cost saving for turbodrilling.

In offset holes, however, bit footage for the turbodrill was only 62 and 95 per cent of rotary average. Savings, as a result, were cut to 5 and 10 per cent.

Larger holes . . . For harder drilling conditions, the turbodrill and rotary were tested in opening a hole of 11 to 17½ in. Location was the Central basin platform of West Texas.

The turbodrill's rate of 24 ft. an hour was 3.7 times that of the rotary. Bit footage of the turbodrill was 81 per cent of rotary. Cost of the hole made by turbodrill was 27 per cent less than that drilled by rotary.

Cautious . . . Mitchell said the tests show that the turbodrill possibly could be used successfully even under its present limitations.

He cautioned, however, against premature optimism for its use under all conditions. In the softer formations, where rotary penetration rates and bit footages are high, the turbodrill has less advantages, he said. Harder formations offer the turbodrill its greatest opportunity to pile up savings.

Mitchell declared an intensive development program is under way to solve the major problems of bit performance. Only recently another Dresser official revealed a new bit was being developed in England which gives promise of standing up to the rigors of turbodrilling *(The Oil and Gas Journal, April 29, page 108).*

If this proves true, turbodrilling soon may become economical on a large scale.

Writeoffs Ended

ODM closing out program for tankers and pipelines

WASHINGTON. — Expansion programs for pipelines and tankers are being closed out by the Office of Defense Mobilization.

Future projects in those fields will have to be undertaken without the advantage of quick tax writeoff of investment, Director Gordon Gray announced.

The pipeline program has been limited for some months to projects directly tied in with military needs. The tanker goal is practically filled, with 99 of the planned 100 vessels having been approved.

Only 9 of the 229 expansion programs set up following the outbreak of the Korean war are still alive. None of them involve the oil industry.

The tax-amortization program got under way in October 1950. More than 21,860 new or expanded facilities costing over $37.8 billion have been given quick tax writeoff since then. Projects in and for the oil and gas industry accounted for some $4 billion of the total.

With joint pipeline project:

Service Takes on New Venture

DETROIT.—Service Pipe Line Co. is going outside the operations of the parent Standard Oil Co. (Ind.) for the first time.

Service and Aurora Gasoline Co. will build a crude line from Griffith, Ind., to supply two refineries at Muskegon, Mich. Service will build and operate the line. Previously, the company's main job has been to transport crude for refineries of Indiana Standard.

Muskegon Pipe Line Corp. has been organized for the joint undertaking. The 165-mile, 10-in. line will transport crude from the Service system, terminating in the Chicago area, to Aurora and Naph-Sol Refining Co. plants. The plants are now served by rail and Lake Michigan tankers.

The line will be completed late this year with initial capacity of 26,000 bbl. per day. The two refineries have combined capacities of 19,250 bbl. per day, 14,000 for Aurora and 5,250 for Naph-Sol. Naph-Sol has announced a 3,500-bbl. expansion to be completed by October 1.

Service has increased the capacity of its pipeline system into Chicago by 26,000 bbl. per day *(The Oil and Gas Journal, December 24, 1956, page 57)*. New pumping stations at Mayview and Rothville, Mo., will permit an increase in throughput to about 325,000 bbl. per day on this section. Further expansion is planned later this year.

William E. Slaughter, Jr., president of Aurora, is president of Muskegon Pipe Line. M. S. Schiller and Harris Squire, also of Aurora, are vice presidents. J. R. Fredenberger, treasurer of Service, is secretary-treasurer. C. W. Butler, Service operating superintendent, will serve with the officers on the board of directors.

Until the grand jury is over . . .

. . . Justice Wants Pricing Files

WASHINGTON.—The Justice Department last week asked the Alexandria, Va., federal court to order 33 oil companies to retain their records until the end of the current grand jury probe of pricing policies.

Department counsel explained that many companies routinely destroy records which they believe no longer useful. One unnamed company has destroyed its 1955 files of pricing data since the grand jury was called, according to a Justice Department affidavit.

The department wants the companies to retain their files and records "relating to the purchase, distribution, or sale of petroleum or petroleum products" or referring "to the determination, establishment or change of prices for crude petroleum or refined petroleum products."

Unless this is done there is danger that important documents will be destroyed before subpenas can be issued, Joseph E. McDowell, antitrust attorney in charge of the investigation, said.

Who's involved . . . The order disclosed the names of 33 oil concerns.

They include: American Oil Co., Arkansas Fuel Co., Ashland Oil & Refining Co., Atlantic Oil Co., Carter Oil Co., Cities Service Co., Continental Oil Co., D-X Sunray Oil Co., Esso Standard Oil Co., Gulf Oil Corp., Humble Oil & Refining Co., Lion Oil Co., Magnolia Petroleum Co., Ohio Oil Co.

Pan-Am Southern Corp., Phillips Petroleum Co., Plymouth Oil Co., Pure Oil Co., Republic Oil & Refining Co., Shamrock Oil & Gas Co., Shell Oil Co., Sinclair Oil Corp., Skelly Oil Co., Socony Mobil Oil Co., Standard Oil Co. of California, Standard Oil Co., (Ind.), Standard Oil Co., (Ky.), Standard Oil Co., (N.J.), Standard Oil Co. (Ohio), Standard Oil Co. of Texas, Sun Oil Co., The Texas Co., and Tidewater Oil Co.

—— *Industry* briefs

Interior Department's lease sale on 190 acres in Camp Breckinridge, Ky., brought $2,274.92 an acre last week. Felmont Oil Corp., Owensboro, Ky., was the high bidder with an offer of $432,236, plus a 15 per cent royalty. It will drill five wells, starting the first within 60 days.

Carter Oil Co. of Tulsa made the second high bid with a $261,776.30 offer. Twenty-eight companies bid on the acreage, which the Army recently turned over to Interior. Army said oil under Camp Breckinridge is being drained by 6 of 33 commercial wells nearby.

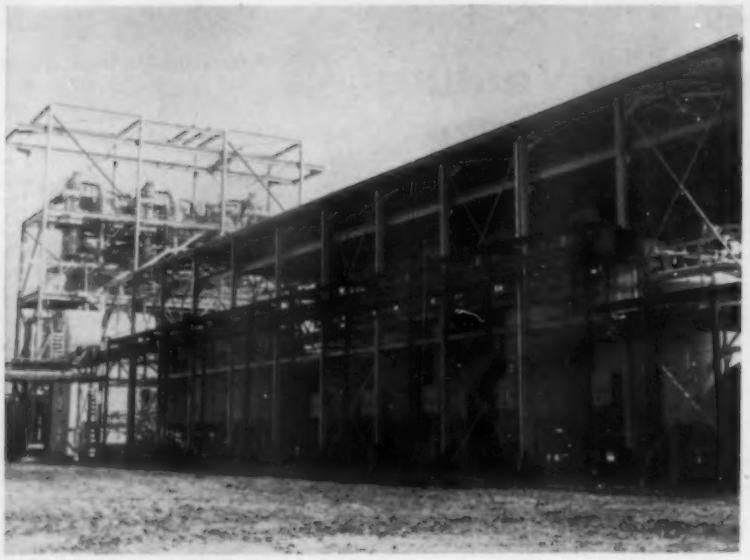
Water-Flood Associates, Inc., has been formed in Fort Worth, Tex., to engineer and operate secondary-recovery projects for independent producers. Curtis McBroom, former vice president of Ambassador Oil Corp., and Bert H. Murphy, former chief engineer on water-flood projects for Ambassador, are partners in the new company.

The fight to restrain the military from gobbling up large oil areas in the outer Continental Shelf moves to the Senate this week. The public lands subcommittee will start hearing May 9 on a bill passed last month by the House. The bill requires the Defense Department to get congressional approval for withdrawals of more than 5,000 acres for military use *(The Oil and Gas Journal, April 22, page 81)*.

Continental Oil Co. 1 Navajo-H wildcat, 3 miles east of Aneth field in San Juan County, Paradox basin, Utah, flowed 171 bbl. of oil in 16½ hours on latest tests of perforations in the Pennsylvanian at 5,930-52 ft. This latest discovery in the Paradox basin is 5 miles west of East Aneth field, the east anchor to the Aneth trend. It is separated from Aneth and East Aneth by dry holes.

Oklahoma Conservation Director Massena Murray is holding a series of informal meetings with Oklahoma operators to discuss and get recommendations on a proposed set of stricter field rules in the state.

Hearing on general field practices was held in Oklahoma City last Monday. A similar meeting in Tulsa Wednesday discussed stricter controls for water floods. A third session is scheduled in Oklahoma City May 13 to lay groundwork for the formal hearing before the Corporation Commission July 10. A decision on new conservation rules will be made by the commission following that session.



HEART OF EXPANSION at Houston synthetic-rubber plant is this double line of reactors and three new stripping columns towering above the reactor building. They show . . .

Goodyear Bets on Big Boom

HOUSTON. — Goodyear Tire & Rubber Co. has completed an expansion program at its Houston synthetic-rubber plant which will make the installation the world's largest single producer of man-made rubber.

Production capacity of Plioflex rubbers at the Houston plant has been increased to 220,000 long tons a year for a gain of 50 per cent.

The expansion program cost almost $10,000,000, nearly equalling the $11,889,000 which Goodyear paid for the plant 2 years ago. Built by the Government during World War II, the plant started producing synthetic rubber in 1943 to supplement the nation's dwindling supplies of natural rubber. Goodyear, which formerly operated the facilities for the Government, has been operating them independently since April 1955.

Company officials pointed out that production has increased under private ownership while prices remained stable.

"Indications are that within a few short years world-wide demand for rubber will exceed present supplies," said Goodyear President E. J. Thomas, "and we have moved to beat what could otherwise develop into an acute shortage of this vital material with runaway prices."

Main units added to the plant are two new reactor lines, each containing 11 reactors of 5,000-gal. capacity each, and a new recovery area consisting of three stripping columns. Unreacted styrene is recovered from synthetic rubber latex in the stripping columns. From there, latex is moved by pipeline to the finishing building where the rubber is coagulated, dried, and baled.

Addition of spherical blend tanks makes possible a sevenfold increase in storage of butadiene. Styrene storage capacity also was increased.

Drilling Island to be Built

REDONDA BEACH, Calif.—Signal Oil & Gas Co. will start construction this week on an earth-filled island as a base to continue development drilling on Redonda Beach's tidelands.

The island, which will be 300 ft. wide, will project 120 ft. into the ocean in water up to 11 ft. Tentative plans call for two drilling rigs to work at the same time. The island will accomodate 48 wells. It is scheduled for completion in July.

Signal completed six slant-drilled wells in the area from a landscaped onshore site last year *(The Oil and Gas Journal, February 11, page 71).*

Rig Haulers Want Increase

DALLAS. — Drilling contractors, squeezed between climbing costs and slumping rig activity, may be dealt another blow to the pocketbook in Texas.

Oil-field-equipment haulers are asking the Texas Railroad Commission to jack up the hauling rate 25 per cent and to raise minimum charges.

The application was filed by the Oil Field Haulers Association, Inc., and the Specialized Motor Carriers Association. They asked that the hauling rate be boosted to 15 from 12 cents a mile and the minimum charge raised to $7.50 from $5.

The haulers said the last increase in rates was in 1949. Bread and butter item of the haulers is rig transporting.

Pasotex Lays Line

Wink-El Paso line to be finished next September

EL PASO.—Pasotex Pipe Line Co. has completed another link in its 20-in. crude line between Wink and El Paso which will replace the existing dual 8-in. system this summer.

Last year Pasotex laid 68 miles of 20-in. on the 195-mile route and 72 miles were added this spring. R. H. Fulton & Co., Lubbock, has just completed the most recent section, which is being water tested. The remaining 58-mile gap, between Guadalupe and Hueco, and between Hueco and El Paso, will be closed in this summer.

Pipe delivery was scheduled to start last week. Construction will begin in June. By September 1, Pasotex expects to retire the 8-in. lines from crude service.

Capacity of the 8-in. system has been increased from 40,000 bbl. per day to 57,000 bbl. by tying in the 20-in. Throughput of 90,000 bbl. per day will be possible when the new line is finished, and with only the originating Wink station and the Guadalupe booster operating. By reactivating the Hueco and Orla stations, capacity could be boosted to 220,000 bbl. per day.

The Pasotex line serves three refineries at El Paso: Standard Oil Co. of Texas (Pasotex affiliate), 41,000 bbl. daily; The Texas Co., 13,000 bbl. daily; and El Paso Natural Gas Products Co., 4,000 bbl. daily.

The new Pasotex line has been proposed as a part of an emergency crude system to California, a crude-deficit area, in the event of war.

Standard Oil Co. of California, Pasotex's parent company, said crude delivered at El Paso could be shipped through Southern Pacific Pipe Line Co.'s line which now carries products from Los Angeles to Phoenix and El Paso to Phoenix. Socal said another 20-in. line could be laid from the Texas border to southern California in 90 days to make more capacity available *(The Oil and Gas Journal, July 18, 1955, page 69).*

Output Sets New Record

● Free-world production in February tops pre-Suez peak with U. S., Venezuela filling gap in Middle East flow

FREE-WORLD crude production during February overtook and passed the peak level of October.

Total output during the fourth month after closing of the Suez Canal and Iraq-Mediterranean pipelines averaged 15,244,200 bbl. daily. This was a gain of 462,500 bbl. daily over January.

It also was 26,400 bbl. daily over October, the last month of normal operations before Middle East supply routes were disrupted. October output of 15,217,800 bbl. daily was the previous all-time high.

Even though total barrels were nearly the same, February production by areas continued to be lopsided. Here's how the record was achieved:

...The Middle East sliced another 209,800 bbl. daily off its production deficit. But output of 2,855,500 bbl. daily was still only 73.7 per cent of the October level.

...The United States and Venezuela filled the gap in Middle East production. U. S. output reached a new high of 7,682,000 bbl. daily for a gain of 202,000 bbl. daily. Venezuelan production rose 58,200 bbl. daily to 2,850,200 bbl. daily.

Kuwait and Iran led other Middle East producers in production gains. Kuwait's increase of 85,000 bbl. daily put the shaikhdom well ahead of other countries in the area with 995,000 bbl. daily.

Iranian production of 739,000 bbl. daily was the highest for any month in the country's history—before or after nationalization. A sizable share of the crude was delivered to Bahrain refinery. It replaced Saudi Arabian shipments which were withheld from the British-protected shaikhdom.

Iraq, which has taken the worst beating of any country during the crisis, showed a decline of 27,100 bbl. daily to 199,700 bbl. daily.

Venezuelan companies gain . . . The five leading operating companies in Venezuela each had a record month in February.

Creole Petroleum Corp. produced 1,216,400 bbl. daily, up 132,700 bbl. daily over its 1956 average. Cia. Shell de Venezuela, Ltd., produced 875,400 bbl. daily, a gain of 165,100 bbl. daily.

Mene Grande Oil Co. produced 417,100 bbl. daily, up 52,400 bbl. daily over last year. Socony Mobil Oil Co. de Venezuela reached 113,200 bbl. daily, a gain of 16,700 bbl. Richmond Exploration Co. reached 95,200 bbl. daily, a gain of 33,500 bbl.

Egyptian fields reopen . . . Production in three small fields on the western edge of Sinai Peninsula was back to normal in February.

Sudr and Asl reopened in mid-January after mines in the canal were cleared. Ras Matarma, the smallest of the group, reopened in February. The crude was trucked out.

The fields are owned jointly by Socony Mobil Oil Co. and Anglo-Egyptian Oilfields, Ltd. Their combined output was 9,200 bbl. daily.

Limited production also was under way in Anglo-Egyptian fields on the African side of the Gulf of Suez. These fields, Ras Gharib and Hurghada, along with Anglo-Egyptian's interest in the joint Socony operation, have been taken over by the Egyptian Government.

A World-Wide Look at Crude-Oil Output

(Daily average in thousands of barrels)

Country—	Feb. 1957	Jan. 1957	Feb. 1956
W. Hemisphere:			
Argentina	86.8	86.8	85.2
Bolivia	9.9	9.2	8.3
Brazil	24.7	24.7	7.6
Canada	534.0	548.0	466.9
Chile	10.6	10.6	8.9
Colombia	123.0	122.1	114.0
Cuba	1.6	1.5	1.6
Ecuador	9.7	9.7	9.7
Mexico	250.0	250.0	250.2
Peru	53.7	53.7	46.8
Trinidad	87.6	85.6	75.1
Venezuela	2,850.2	2,792.0	2,352.7
Total	4,041.8	3,993.9	3,427.0
W. Europe & Africa:			
Algeria	0.4	0.4	0.9
Fr. Morocco	1.6	1.6	2.2
Egypt	15.0	3.6	36.1
Austria	64.6	64.6	64.2
France	29.1	28.9	20.6
West Germany	73.3	71.0	63.0
Italy	20.4	20.5	8.0
Netherlands	24.8	25.8	17.0
Turkey	6.5	6.5	4.1
United Kingdom	1.6	1.6	1.2
Yugoslavia	6.9	6.9	4.8
Total	244.2	231.4	222.1
Middle East:			
Bahrain	30.1	30.1	30.0
Iran*	739.0	657.0	434.0
Iraq†	199.7	226.8	658.3
Israel	1.1	1.1	0.3
Kuwait	995.0	910.0	1,125.0
Neutral Zone	40.0	30.0	30.0
Qatar	125.7	125.5	125.2
Saudi Arabia	724.9	665.2	1,013.8
Total	2,855.5	2,645.7	3,416.6
Other Asia:			
British Borneo	118.0	118.0	116.4
Burma	4.5	4.5	4.5
India	9.2	9.2	7.5
Indonesia	270.0	280.0	244.9
Japan	6.1	6.0	6.2
New Guinea	7.0	7.1	7.4
Pakistan	5.9	5.9	5.7
Total	420.7	430.7	392.6
Free World:			
Foreign	7,562.2	7,301.7	7,458.3
United States	7,682.0	7,480.0	7,208.0
Total Free W.	15,244.2	14,781.7	14,666.3
Communist countries in Soviet orbit:			
Romania	220.0	220.0	200.0
Russia‡	1,835.0	1,810.0	1,550.0
Others	50.0	50.0	50.0
Total	2,105.0	2,080.0	1,800.0
World total	17,349.2	16,861.7	16,466.3

*Includes estimated 4,000 bbl. daily from Naft-i-Shah field not operated by consortium companies. †Includes estimated 5,000 bbl. daily from Naft Khaneh field, operated by British Petroleum Co. ‡Revised estimate.

Figures are from reliable industry reports or official government sources. Data for Communist countries in the Soviet orbit, which include the European satellites and Red China, are based on competent estimates. Authentic information is not available on month-to-month production in these areas. Estimates also were made for those countries, particularly in Southeast Asia, where complete current reports are lacking.

TREND OVER THE LAST YEAR

1956—	Western Hemisphere less U. S.	Middle East	Total, non-Communist countries
February	3,427.0	3,416.6	7,458.3
March	3,471.2	3,624.3	7,713.8
April	3,320.5	3,736.6	7,690.8
May	3,356.5	3,793.9	7,788.1
June	3,519.1	3,713.7	7,871.7
July	3,549.8	3,806.1	7,996.6
August	3,618.2	3,685.8	7,965.6
September	3,637.2	3,721.8	8,019.3
October	3,688.3	3,873.5	8,251.8
November	3,760.8	2,142.8	6,544.2
December	3,915.9	2,428.9	6,989.7
1957—			
January	3,993.9	2,645.7	7,301.7
February	4,041.8	2,855.5	7,562.2

Italy Claims New Deal

Reports say 8,880-sq.-mile onshore-offshore concession in Iran to be explored by joint Iranian-Italian company

ITALY'S Enrico Mattei is swinging hard to wrap up an oil-exploration deal in Iran which has some of his own countrymen and a good many international oil men muttering to themselves.

Mattei, who heads the Italian-owned Ente Nazionale Idrocarburi (E.N.I.), very carefully leaked the word a month ago to a favored few among Rome's press that he had made a deal to exploit the newly found Qum field in Iran. This spread across Europe like wildfire. The story was met in the United States with open skepticism.

The report was finally denied flatly by a National Iranian Oil Co. spokesman after the rumors circulated more than 2 weeks. At that time the N.I.O.C. spokesman said his company had talked to the Italians about buying Iranian oil and nothing more *(The Oil and Gas Journal, April 8, page 87)*.

Last week the Italian-Iranian story was getting hot again. This time there was no mention of Qum. The reports all came from Rome and were made by E.N.I. spokesmen. The Iranian government company made no comment.

Here's the deal that the E.N.I. spokesman said was signed a month ago by Mattei and M. Bayat, head of N.I.O.C. at a Teheran meeting:

...An 8,880-sq.-mile exploration concession in three sections of Iran to be operated by a jointly owned Italian-Iranian company. The company would be called Societa Italo Iraniana Dei Petroli (SIRIP).

...A 50 per cent interest in SIRIP would be held by the Iranian government company, which would put up no money. It would pay its half of the costs only after oil is discovered.

...SIRIP would divide its profits equally with the Iranian Government. Since the government owns one of the partners in the operating company, Iran would in effect be taking a 75 per cent cut of any profits.

According to E.N.I.'s official Rome statement, the concession area is divided like this:

...Offshore in the northern Persian Gulf beyond the territorial waters of Iran. This would be a Continental Shelf operation because the international consortium which operates Iran's fields has offshore rights in Iranian territorial waters.

...An area on the eastern side of the Zagros range of mountains in central Iran. This would lie to the east of the consortium concession which borders the entire Persian Gulf region of Iran.

...A coastal area in extreme southern Iran along the Gulf of Oman.

According to the Rome statement, E.N.I. has agreed to spend $6 million during the first 4 years of the agreement and at least $2 million a year for the next 8 years. E.N.I. has the option to quit after 4 years.

Possible hitches . . . Rome circles have expressed complete confidence that the deal will go through. But first it has to be approved by the Iranian Majlis (parliament).

Mattei, himself a member of the Italian Chamber of Deputies, is already under political fire in his own country for his failure to develop a thriving domestic oil industry in spite of the fact that he enjoys a virtual monopoly. The Iranian agreement is almost certain to fan this criticism.

Another question mark lies in the fact that the offshore third of the reported concession is under waters from 70 to 100 ft. deep. And E.N.I. has had no offshore drilling experience.

Observers point out that a full-scale offshore drilling operation could eat up the initial $6 million which Mattei has agreed to spend in pretty short order.

Political fuss touched off as . . .

Brazil Confirms Amazon Pay

BRAZIL has had its first real Amazon basin encouragement since the Nova Olinda discovery more than 2 years ago infected the country with oil fever.

Nova Olinda 2-A, slightly less than 3,000 ft. from the discovery, has tested 12 to 16 bbl. of very light oil on a 40-minute drill-stem test. The flow was under high pressure from a 20-ft. sand section encountered between 8,977 and 8,997 ft.

Analysis of the crude at the Manaus refinery indicated it is 44.1° paraffinic oil with a 40 per cent gasoline cut, 15 per cent kerosine, 20 per cent fuel oil.

Bottom-hole pressure was gaged at 1,975 psi. with the tool open. It rose to 2,551 psi. within 14 minutes after the well was shut in. The well is being deepened.

Gravity of the crude indicates it is of even better quality than oil from the discovery. When initially tested 2 years ago, the discovery well made 250 bbl. daily of 40° gravity crude.

The new test was drilled on Ilha Maraca, an island in the Rio Madeira, one of the upper Amazon's navigable branches. The confirmation was regarded as so important that Col. Janary Gentil Nunes, head of Petroleo Brasilero S. A. (Petrobras), the government oil agency, visited the location personally.

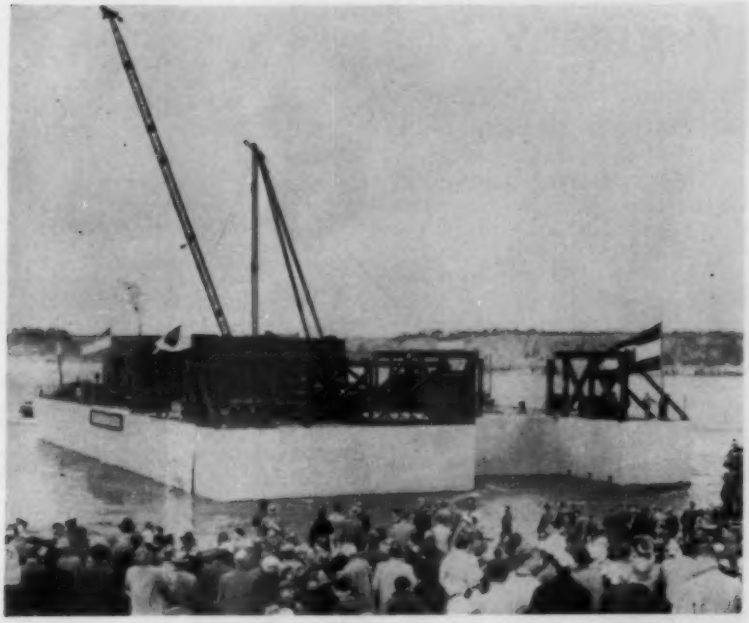
Nationalist clarion call . . . A few days after looking over the new Nova Olinda well, Colonel Nunes launched one of the bitterest attacks yet on privately operated international oil companies.

His attack, made in an address before the Military Club in Rio de Janeiro, accused international oil companies of encouraging dictatorial regimes in the world so they could cling to oil resources and maintain low wages for workers. The address also came only a few days after a Brazilian legislator said he planned to introduce a bill to loosen the Petrobras control over Brazil's oil industry. Deputy Adolfo Gentil said he would open exploration, production, and refining activities to private Brazilian citizens *(The Oil and Gas Journal, April 22, page 99)*.

In his Rio address, Colonel Nunes commented that Brazil is one of the few nations in the world to "escape" the influence of American and British oil companies. He detailed for his audience the progress that Petrobras has made and claimed the country's 1957 oil production will average more than 27,500 bbl. daily compared to the 1956 average of slightly less than 11,000 bbl. daily.

All this production has come from the long-established Reconcavo fields in Bahia which are being further developed by Petrobras.

In contrast to this rise in production, Brazil's oil consumption this year is expected to top 205,000 bbl. daily. Importing the deficit between domestic production and internal consumption cost the country $300 million last year.



Barge Heads for Persian Gulf

THE drilling barge, Adma Enterprise, was launched recently (see photo), but is still a long, long way from the water in which it will drill.

The new unit is being prepared for towing halfway across the world. It will be moved from Schacht-Audorf on Germany's Kiel Canal, where it was launched, to a drill site off Abu Dhabi in the southern portion of the Persian Gulf.

The 200-by-100-ft. barge was built for Abu Dhabi Marine Areas, Ltd., owned two-thirds by British Petroleum Co., Ltd., and one-third by Cie. Francaise des Petroles. The unit is fitted with four retractable legs 10 ft. in diameter and 165 ft. long. A self-contained unit, the barge has storage facilities for cement, chemicals, fuel oil, salt and fresh water and air-conditioned living quarters for 50 men.

The new unit's first test will be 200 miles off the island of Das in the Persian Gulf where the company is setting up a base camp about 60 miles from the Abu Dhabi mainland. The first well is expected to be spudded early next year *(The Oil and Gas Journal, March 11, page 118).*

Reds Develop Small Field in Bulgaria

RUSSIA has parted the curtain of secrecy surrounding Bulgaria's postwar oil industry.

According to official Soviet data, Bulgaria produced 4,500 bbl. of oil daily during 1956. This compares with a little less than 3,000 bbl. daily in 1955. The satellite's refineries are processing about 1,000 to 1,200 bbl. daily, only one-fourth of the domestic output. Main products are diesel oil, residual fuel oil, and asphalt.

Plans call for doubling Bulgaria's refining capacity within the next 4 years through expansion of existing installations. By 1960, the nation expects to be refining 2,400 bbl. daily, about 50 per cent of current output.

More than half of Bulgaria's oil production is now being exported to Czechoslovakia, Poland, West Germany, Greece, and other countries.

New field developed . . . The U.S.S.R. Ministry of the Oil Industry says that oil and natural gas were discovered near the town of Kavarna in Drobruja Province of northeastern Bulgaria in 1951, and that the field has since been developed with the aid of Russian specialists and equipment.

The ministry declared that private Swedish, German, and Bulgarian firms had conducted exploratory drilling in the area between 1925 and 1944 "but found only petroleum gas and salt water."

The Russian report said the Kavarna oil is of the "aromatic - naphthenic" type.

Turkey Gets Tests

Esso spuds in Thrace, two wildcats testing Bosporos

ESSO STANDARD (Turkey), Inc., has spudded its first test for oil in Thrace, the European section of Turkey, since the country denationalized its oil industry 2 years ago.

The Esso well, Ceylan 1, is about 8 miles west-northwest of Istanbul. It is the first test in Thrace since unsuccessful drilling in the Murefte area more than 20 years ago.

The Jersey Standard affiliate has four exploration licenses covering more than 400,000 acres in European Turkey and an additional 24 licenses in central and southeastern Turkey where it is still carrying on geophysical and geological work.

Other tests . . . Two other tests are under way by American companies in the portion of Turkey which lies across the Bosporus.

American Overseas Petroleum, Ltd., a Caltex affiliate, was drilling below 7,000 ft. last week on its deep test 18 miles from Gaziantep in southern Turkey. The well is being drilled on contract by Brown Drilling Co., Long Beach.

The first well drilled in Turkey after the country's new oil law opened the region to private companies is a slant-hole test exploring an anticline which extends from Iskenderun Gulf out under the Mediterranean. It is being drilled by Turkish American Oil Co. on a farmout from Gilliland Oil Co. of Los Angeles.

The same firm plans a second farmout on a 125,000-acre Gilliland concession in the Cizre area near where the Syrian and Iraqi borders meet in extreme southeastern Turkey *(The Oil and Gas Journal, January 28, page 138).*

Companies Plan Merger

Directors of Columbus Rexall Oil Co. of Long Beach have approved a merger with United Caribbean Oil & Mining Enterprises, Inc., of Nassau and Havana. The merger is subject to approval by stockholders of both companies. Basis for the deal is one share of United Caribbean for nine shares of Columbus Rexall.

United Caribbean has 14 producing wells in Cuba, two concessions in Venezuela, and acreage in the Tilston-Turtle mountain region of North Dakota. Columbus Rexall has small holdings in the Dominguez and Yorba Linda fields in the Los Angeles Basin.

Shell Expands in Germany

Big $170-million program includes new pipeline, nation's largest refinery, and expansion at petrochemical plant

DEUTSCHE-SHELL A.G. is going to spend about $170 million in West Germany during the next 4 years on refining, pipeline, and petrochemical projects.

H. Van Drimmelen, chairman of the German affiliate of the Royal Dutch-Shell Group, revealed in Cologne plans for the whopping expenditure shortly after plans for a new refinery were revealed.

The German Shell company will spend the money on the following four major projects:

... **An 80,000-bbl.-daily refinery** between Cologne and Bonn. To cost almost $62 million, the new refinery will be located on the left bank of the Rhine near the river port of Godorf and will be called "Shell Refinery West." Plans call for expanding the plant to a possible 140,000 bbl. daily later *(The Oil and Gas Journal, April 22, page 99)*. It's initial capacity will make it West Germany's largest refinery.

... **A 120-mile pipeline** to link the new refinery with the Rotterdam terminus of the huge Sappeur pipeline project which calls for a major large-diameter crude pipeline from Marseilles to Rotterdam. The German Shell company is taking part in the big trans-Europe pipeline.

Cost of the 120-mile line, which will be 20 and 24-in. in diameter, is estimated at $28 million to $34 million. The line's daily capacity in initial stages of its use will be from 160,000 to 200,000 bbl. daily. The pipeline and refinery will both be completed by 1960.

Gelsenberg Benzin A.G., which operates a 60,000-bbl.-daily refinery at Gelsenkirchen, will be a partner with the Shell company in building the pipeline.

Reports from Germany last week speculated that Union Rheinische Braunkohlen Kraftstoff A.G., which operates a 28,000-bbl.-daily refinery at Wesseling just a few miles from the site of Shell's planned refinery, may also take an interest.

... **The petrochemical plant at Wesseling,** owned jointly by Shell and Badische Anilin is being expanded to triple its present output. Plans call for the annual output of the plant to reach 30,000 tons of olefin products and 36,000 tons of ethyl benzene within the next 18 months.

Half this $34 million cost will be borne by the Shell company.

... **Shell's Hamburg - Harburg refinery** is now being expanded from its 19,500-bbl.-daily capacity to a throughput of 52,000 bbl. daily. This expansion program is expected to cost almost $59 million.

More Prices Bared

Conoco group, Creole pay $53 million in Venezuela

THE Venezuelan Government has officially confirmed the award of extensive petroleum concessions to two more American-owned companies.

Winning bidders were Creole Petroleum Corp. and a group of American firms headed by Continental Oil Co. of Venezuela. Their combined investment in the announced concessions totaled $53,557,200. The Gaceta Oficial in Caracas gave this breakdown.

... **Creole** paid $6,901,200 for five 10,000-hectare exploration concessions in Barinas. It accepted an additional price of $486 an acre due when it decides to pick an exploration block.

... **Continental** combine invested $46,656,000 in three blocks in the Gulf of Paria. The prices were $25,631,640 for one exploration tract of 10,000 hectares, $15,017,400 for a second tract of the same size, and $6,006,960 for a third.

Participating with Continental in the venture are The Texas Co., Standard Oil Co. (Ohio), Cities Service Co., and Richfield Oil Corp.

The first revelation of prices paid in latest awards of concessions came 2 weeks ago. The government is releasing the notices piecemeal in the official newspaper.

Moscow Gas Line Started

Russia has started construction of its second 808-mile natural-gas pipeline from Stavropol in the Northern Caucasus to Moscow. The first link, using 28-in. pipe, went into service last December.

Approximately 560 miles of the second Stavropol-Moscow line are scheduled for completion this year. This will represent over one-third of the U.S.S.R.'s 1,484-mile gas-pipeline construction goal for 1957.

Moscow is now getting a maximum of 141 million cubic feet of gas daily from the first Stavropol line.

Completion of the parallel link will provide the Soviet capital with 20 times as much gas as it receives from the 12-in. line originating at Saratov on the Volga River. The 500-mile Saratov-Moscow line, built during World War II, was Russia's first long-distance natural-gas line.

Refinery Planned

European price war seen if German plant is built

GOTTLIEB DUTTWEILER and the Migros Co-operative have popped up again in the European marketing picture.

The Swiss financier, who heads Migros, reportedly plans to build a $17,000,000 to $20,000,000 refinery at Emden, West Germany. Purpose would be to carry on competition with major companies across the Swiss border.

Plans for the new subsidiary, to be named Oil Co. Frisia, are not yet final. Financing must be arranged, and approval of German government officials is needed.

Migros, a large Swiss merchandising company which deals in groceries and other fields, organized a gasoline marketing company, Migrol, in 1954. The entry of Migrol touched off a price war with the established Swiss dealers' association.

Migrol's source of crude is the Neutral Zone, purchased from American Independent Oil Co., and refined in locally owned plants in Italy, Belgium, and West Germany.

Duttweiler also is reported ready to renew the price war in Switzerland.

Pemex Buys 18 New Rigs

Petroleos Mexicanos has bought a dozen new heavy rigs and six light ones, pushing the total number of Pemex rigs to 168.

Delivery of the new equipment—Idecos and Nationals—will begin in May. Pemex purchased 20 of the same types last year.

San Andres field, 10 miles southeast of Poza Rica, is the center of the government - owned company's stepped-up drilling program. Fifteen rigs are now running in the field, with two completions per month expected.

Pemex indicates San Andres is the biggest discovery in Mexico in 25 years. Output is from Jurassic or Lower Cretaceous below 11,000 ft., deepest production in the country *(The Oil and Gas Journal, March 18, page 106)*. The 24 San Andres is the latest development well. It tested 2,740 bbl. daily from 11,220 ft.

Philippines Hunt Picking Up Steam

THIS mesa-dotted landscape has some of the surface features that are making exploration departments take a hard look at the Cagayan Valley in northern Luzon.

Standard-Vacuum Oil Co. is drilling ahead at 4,500 ft. in this general area. The test, Faire 1, is on cross-option acreage. Philippine Oil Development Co. (PODCO) can buy an interest if a commercial discovery is made.

PODCO and Stanvac will spud a joint well, 2 Tumauini, this month. It will be located 40 miles south of the Stanvac test.

PODCO abandoned 1 Tumauini last year at 10,414 ft. after finding noncommercial gas and oil shows. Caltex since then has exercised its option to participate with PODCO on areas covering 900,000 acres. The companies will share expenses and any production on a 50-50 basis.

Big French Gas Pool Tapped

SOUTHWESTERN France last week tapped for the first time what may become its greatest source of industrial power—Lacq gas field.

Discovered in 1951 at below 11,500 ft. during a search for deeper oil pays, Lacq's high-pressure and extremely sour gas has given French engineers a host of problems. The French think the gas field may cover 10,000 acres and may contain gas reserves of 14 trillion cubic feet. It underlies the 2,200-ft. Lacq oil field, which produces about 3,300 bbl. daily.

The 18 per cent hydrogen sulfide content of the gas gives the French their biggest problem. It means special alloy steel tubing for wells and gathering systems.

Desulfurization plant . . . First phase of bringing the field on production was completed last week. It involves operation of a desulfurization plant which will process 35,000 M.c.f. of gas daily and send almost 23,000 M.c.f. of dry gas into a pipeline system serving several towns and industries in southwestern France.

The plant will produce 60,000 tons of sulfur a year, about 95,000 bbl. of natural gasoline, and about 87,000 bbl. of propane and butane.

By the end of next year, the French expect to have the desulfurization plant expanded enough to process more than 140,000 M.c.f. of sour gas a day, producing more than 92,000 M.c.f. of dry gas for industrial use. By 1962, this output will be doubled, according to present plans.

This annual gas output would be equivalent to 6,000,000 tons of coal or about 27,000,000 bbl. of fuel oil which France must now import.

——World briefs

Bolivia has awarded concessions covering 1,232,000 acres in the southeastern part of the country east of the Andes to three United States companies.

The companies in the joint venture are Standard Oil Co. (Ohio), Pure Oil Co., and Hancock Oil Co. Each will have one-third interest in the concessions. The actual grant went to a Pure Oil subsidiary, Andes Oil Co.

Crude from Saudi Arabia's first offshore field, Safaniya, is selling for $1.68 a barrel f.o.b. at Ras Tanura. This is the initial posting made by Mobil Overseas Oil Co., Inc. The field was recently placed on stream by Arabian American Oil Co. *(The Oil and Gas Journal, April 22, 1957).* Safaniya crude has a gravity of 27°.

West Germany chalked up two small but significant discoveries in the Upper Rhine Valley last week. The Leopoldshafen 1-A, drilled by C. Deilmann Bergbau G.m.b.H. and Wintershall A.G. 5 miles north of Karlsruhe, drill-stem tested 64 bbl. daily from the Meletta sand at 4,053-63 ft., through ⅛-in. choke. Gravity was 39.5°.

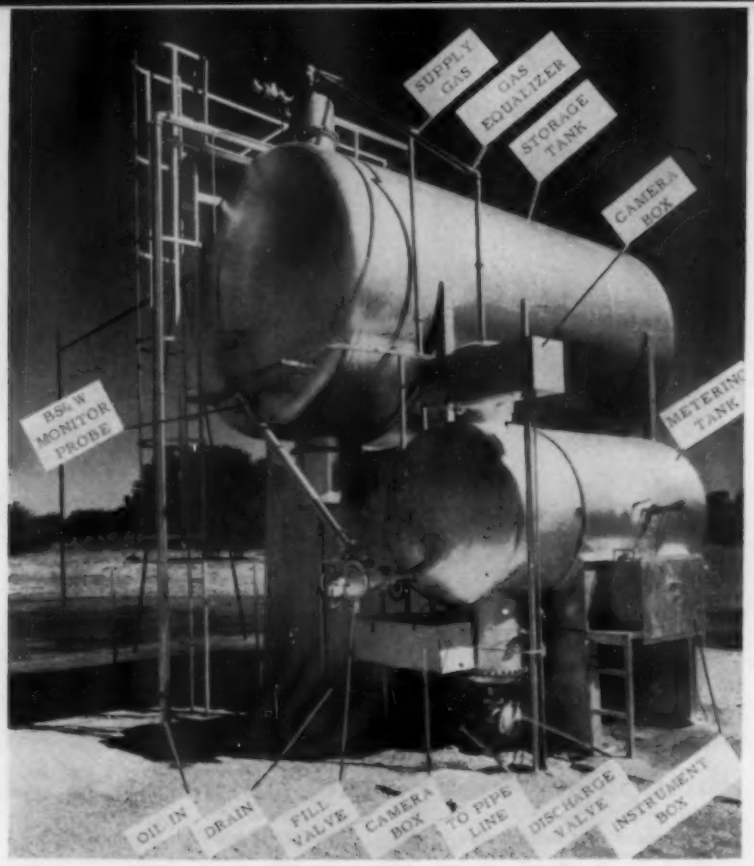
The secondary discovery was Gewerkschaft Elwerath's Hayna 1 located 10 miles southwest of Germersheim. It pumped about 30 bbl. of 39.7°-gravity oil daily from the bottom sands of the Upper Pechelbronn at about 4,500 ft.

India's fourth and newest refinery has placed its 13,500-bbl. two-stage crude unit on stream. Caltex (India), Ltd., is building the refinery at Visakhaptanam on India's east coast of the Bay of Bengal. Caltex is owned jointly by The Texas Co., and Standard Oil Co. of California.

When all the units are on stream within the next few months, the Caltex refinery will have a 7,400-bbl. daily fluid cat cracker with gas recovery facilities, a 750-bbl. cat poly unit, and blending and treating units. The plant operates on Middle East and Sumatra crude.

Japan's newest refinery will get most of its crude from Kuwait. Idemitsu Kosan Kaisha, a Japanese refining firm, will buy 15,000 bbl. daily for 15 years from Gulf Oil Corp., for its 20,000-bbl. plant at Tokoyuma. Delivery of the 31°-31.9°-gravity crude has already begun, at a cost below the posted price of $1.72 per barrel.

Factory-Built L.A.C.T. Unit Is Gas Operated



L.A.C.T. UNIT of Pan American Petroleum Corp. now operating in southern Oklahoma. Lease oil flows into upper 440-bbl. storage tank then into lower metering tank. When full, the metering tank dumps its 60 bbl. into the line. Fig. 1.

● Pan American's new design of a lease automatic custody transfer unit has the simplicity to make it an assembly-line-produced item. As a package unit, its inherent low cost should prove attractive to operators considering L.A.C.T. Over a 200-dump test against manual gaging in 300-bbl. tanks the difference in volumes measured was less than 0.1 per cent.

by Ralph W. Hill

PAN AMERICAN PETROLEUM CORP. recently introduced a new kind of lease-automatic-custody-transfer system. It is in fully automatic operation. L.A.C.T., of itself, is an important new device to oil producers. A number of individual L.A.C.T. units are now available from several firms; Pan American's new system is the newest of these.

No device of this type can be wholly unique, but each has different and unique features. In Pan American's system, the difference lies principally in these points:

1. Pneumatically controlled and uses no outside source of electrical power.
2. Factory fabricated.
3. Simplicity of design. A minimum of valves, controls, and other parts subject to wear and malfunction.

Other features of the Pan American unit are these:

1. Simple Construction

(a) Only two liquid valves are involved in volumetric measurement.

(b) No pumps are required.

(c) Much of the instrumentation consists of simple, visible mechanical linkages.

(d) A minimum number of dynamic devices subject to wear or malfunction.

(e) All parts exposed to oil, and all dynamic parts exposed to atmosphere are noncorrosive or corrosion resistant.

(f) Clean, dry pilot gas is used.

(g) Duplicate indicators for temperature and number of dumps, actuated by independent linkages.

(h) No weathering time or control required for metering tank.

(i) No. b.s. and w. settling in normally empty metering tank, eliminating manual or complicated automatic recycling.

(j) Valves can be readily checked for leakage by observing overnight change in liquid level in bottom-neck gage glass.

(k) Tank draindown can be readily checked, and compensated for by adjusting lower-neck float.

(l) Factory fabricated and assembled by skilled workmen.

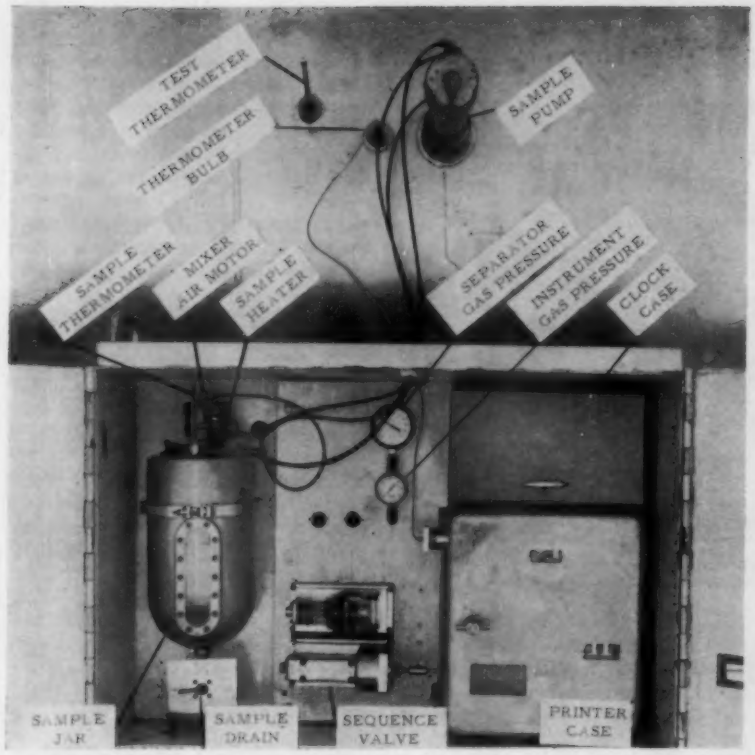
2. Accurate

(a) Seraphin necks with snubbers on metering tank result in accurate level control. One-fourth-inch variation in level amounts to only 0.01 bbl. in 60 bbl., or 0.017 per cent.

(b) Metering-tank contents thoroughly mixed due to rapid filling and inlet locations. Results in more rep-

Author is senior mechanical engineer, Pan American Petroleum Corp., Tulsa.

PRODUCING



INSTRUMENT BOX, showing pressure sample jar with mixer and heater to assure representative composite sample. Fig. 2.

resentative sample and accurate average temperature measurement.

(c) Sampler takes exactly same volume of sample from each 60-bbl. dump, assuring accurate proportioning without complicated equipment.

(d) Pressure sample jar with mixer and heater assures representative composite sample.

(e) Temperature integrator and recorder can be readily checked by standard glass thermometer.

(f) Small metering tank allows monthly allowable to be run to within plus or minus 30 bbl.

3. Can be used where electricity is not available.

4. Simple to operate.

(a) To start the monthly run, stamp fixed dates on run ticket with addressograph plate, write in date and integrated temperature counter reading, install run ticket, and set monthly allowable shutdown counter for allowable number of dumps.

(b) At the end of the month, remove run ticket and write in date and temperature counter reading. Mix and heat composite sample and remove portion for b.s. and w. and A.P.I. gravity tests. Write b.s. and w. and A.P.I. gravity on run ticket.

5. Simple to maintain.

(a) Most maintenance can be handled by existing company personnel, as the pilot gas controls are simple and understandable.

6. Mismeasurement safe features.

(a) Pilot gas failure shuts unit down. Unit continues same sequence without mismeasurement when pilot supply is restored.

(b) Mechanical linkages from sequence control valve to all instruments. Provide positive actuation not dependent upon electric or gas power.

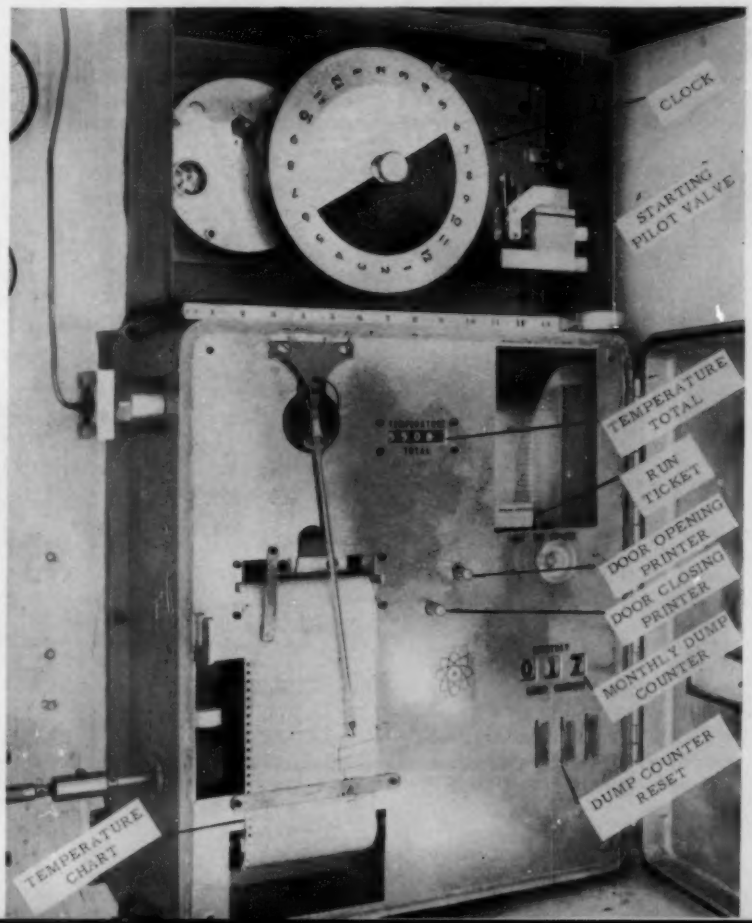
(c) Only two liquid valves involved in volumetric accuracy, and they cannot be open or partly open simultaneously. Valve leakage can be visually detected.

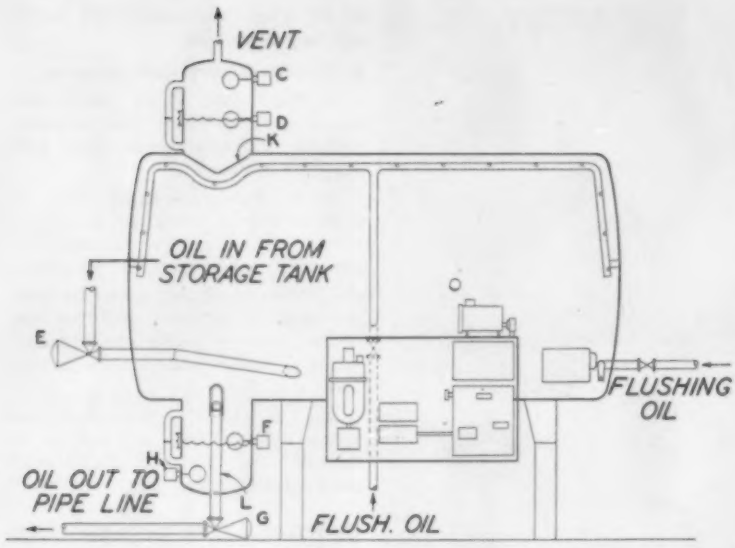
(d) The number of dumps, and dump temperatures, are incated or recorded by duplicate, independent mechanisms.

Operation . . . The following illustrations and explanatory captions give a step-by-step, detailed account of the operation of the Pan American unit.

The Pan American L.A.C.T. unit consists essentially of an elevated horizontal 440-bbl. storage tank, a 60-bbl. calibrated horizontal metering tank, a metering-tank dump counter which prints on a run ticket, a strip-chart recorder which records temperature and dumps, a temperature totalizing

PRINTER CASE. Metering-tank dump counter prints on a run ticket. Temperature and dumps are recorded on strip chart. Fig. 3.





METERING TANK. Fill valve E and discharge valve G are closed between daily runs. Metering tank is empty except for small amount oil below lower float. Fig. 4.

counter, a b.s. and w. monitor, a sampler and pressure sample jar with a mixer and heater, a monthly allowable shutdown controller, a clock-actuated daily run controller, and necessary valves and pilot-gas controllers. See Figs. 1, 2, and 3.

The factory-assembled, self-contained unit is entirely automatic except that, when the run ticket is replaced once or twice a month, the composite sample must be manually tested for A.P.I. gravity and b.s. and w. determination. No outside power is required, as all valves and pilots are gas actuated by bottled propane.

Filling metering tank . . . Between daily runs, the metering-tank fill valve E and discharge valve G are closed, and the metering tank is empty, except for the small amount of oil which remains below the lower float. See Fig. 4.

The day's run is started by a 31-day spring-wound clock which actuates the valve controlling the pilot gas supply to the entire system.

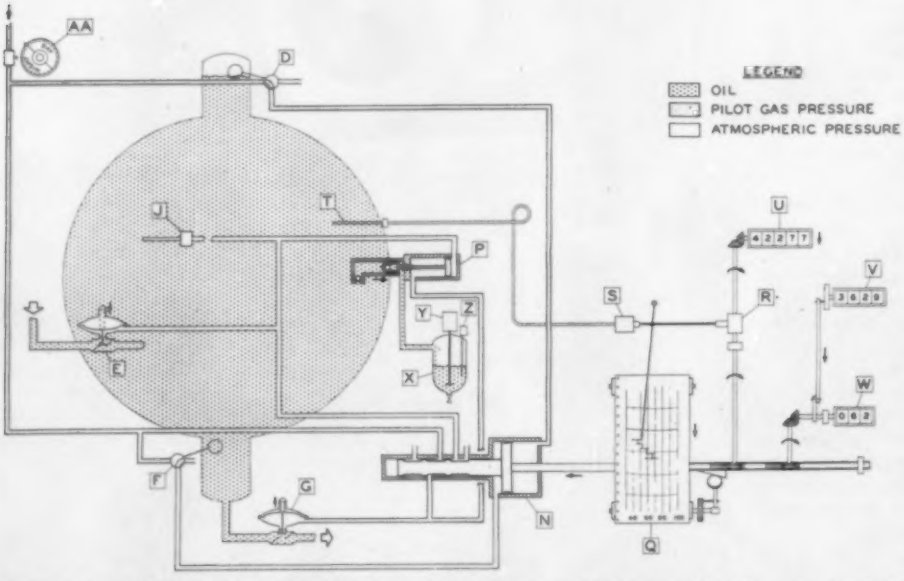
The battery-powered b.s. and w. monitor is actuated momentarily to determine whether the oil meets pipeline requirements. If bad oil is indicated, the storage-tank drain valve opens and the oil is recycled through the treater, or an alarm is actuated so the pumper can adjust the treating equipment and recycle. If the oil meets pipeline requirements, and there is at least one metering-tank volume of oil above the outlet in the storage tank, the metering-tank fill valve opens.

The metering tank fills rapidly until the oil level reaches the snubber K in the bottom of the upper neck. The snubber consists of a coned partition in the lower end of the neck with a small orifice in the apex. The oil must then pass through the orifice in the snubber, so the rate of liquid level rise in the upper neck is low, assuring accurate level control.

Emptying meter tank . . . The emptying rate of the metering tank depends upon the capacity of the pipeline pump or gravity gathering system into which it discharges. On emptying, when the liquid level in the metering tank reaches the entrance of the lower neck, a float closes the entrance to the 4-in. diameter riser L inside the neck, which extends from the outlet to a point even with the top of the neck. The oil must then pass through a small orifice in the bottom of this riser, reducing the withdrawal rate and reducing the rate of liquid-level drop in the lower neck, assuring accurate liquid-level control.

Upper-float action . . . Equipment operation when the metering tank becomes full is shown in Fig. 5. When the level reaches the upper float D, the pilot actuates a sequence control valve N to the left, which in turn closes the fill valve E and opens the discharge valve G, in sequence. An interlock (not shown) is provided so that the discharge valve cannot open until the fill valve is fully closed.

Simultaneously, a ¼-pt. sample is withdrawn from the tank by means of the sample pump P, which is simply a gas-actuated piston pump, which withdraws the sample in one stroke. Simultaneously, also, the sequence control valve mechanically indexes a temperature recording chart Q by 1/12-in.



EMPTYING STARTED. This is simplified instrumentation diagram showing operation when metering tank has become full. Level is at upper float D. Valve E is closed and Valve G opened. Fig. 5.

The sequence-control valve also mechanically actuates a temperature integrator R, which adds the dump temperature to the existing reading on a nonreset digital counter U. The temperature integrator and recording pen arm are positioned by a piston S actuated by the mercury in the thermometer bulb T.

In order to simplify this explanation, safety-control features are not shown.

Oil sample . . . When the run ticket is removed the composite sample in the pressure sample bottle, under pressure of 25 psi., is mixed by an air-motor-driven mixer Y. In cold weather, or if the paraffin problem is severe, the composite sample can be heated by an electric heater Z, energized by an air-motor-powered generator. After thorough mixing, a quantity of the composite sample sufficient for centrifuging can be removed, and the rest of the sample can be forced into the tank by gas pressure.

Lower-float action . . . Fig. 6 shows equipment operation at the end of a metering-tank dump. When the liquid level reaches the lower float F, its pilot actuates the sequence control valve N to the right. By means of a mechanical linkage to the sequence-control valve, a nonreset printing dump counter V is indexed one digit, the resettable monthly allowable counter W is indexed one digit, the b.s. and w. monitor J is actuated to determine whether pipeline oil is available for the next fill, and the sample previously withdrawn into the pump is discharged from the pump P to the pressure sample bottle X.

Then, if the b.s. and w. monitor indicates that pipeline oil is available, and if there is sufficient oil in the storage tank to fill the metering tank at least once, the fill valve again opens and the cycle is repeated. This continues until the storage-tank float pilot located 60 bbl. above the storage-tank outlet, indicates that there is insufficient oil to fill the metering tank again.

Then the unit shuts down until the following day, when

PIPELINE COMPANY

SEAL OFF 08612

OWNER STANOLIND OIL & GAS CO
FARM S. M. MC DANIELS :B:
FARM NUMBER 16579
TANK NUMBER
CERTIFIED CAP. 59.215

Addressograph Plate

DATE INSERTED 6-1-56

TEMP. COUNTER 58690

Joe Smith
GAGER
John Doe
WELL OWNERS WITNESS

POWER FURNISHED BY
TO

COUNTER DUMP
464
485
485
544

Printed when instrument case door closed after run ticket was inserted.
Printed when door opened for minor maintenance.
Printed when door closed after maintenance.
Printed when door opened to remove run ticket.

DATE REMOVED 6-21-56
TEMP. COUNTER 65558
B. S. & W. % 0.2
OBSERVED GRAVITY 47.2

Joe Smith
GAGER
John Doe
WELL OWNERS WITNESS

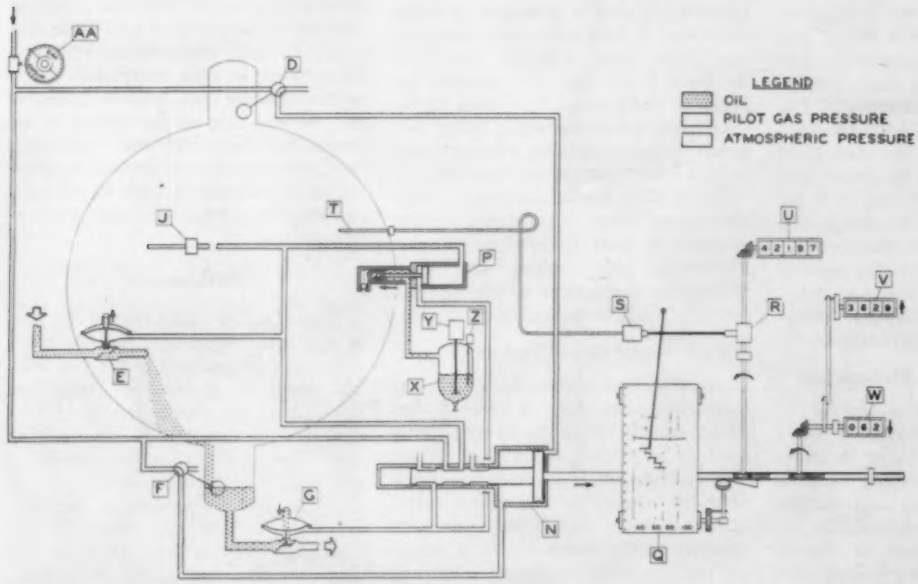
NUMBER OF DUMPS 80
GROSS BBLS 4737.200
AVERAGE TEMP. °F. 6868/80 = 84.6
GROSS BBLS. 60°F. 4679.41
NET BBLS. LESS B. S. & W. 4670.05
REMARKS:

Office Calculations.

SEAL ON 71576

This ticket covers all claims for allowance. The oil represented by this ticket was received and run as property of

RUN TICKET. At beginning of month, the integrating temperature counter reading is written on a special run ticket. Fig. 7.



FILLING STARTED. Showing operation at end of a metering-tank dump. When level reaches lower float F, unit shuts down till following day when clock again starts cycle. Fig. 6.

the clock AA again starts the cycle. The clock serves only to start the day's run; the run ends when there is no longer a metering tank full of oil in the storage tank or when daily allowable has been run.

Run ticket . . . At the beginning of the month, the integrating temperature counter reading is written on a special run ticket (see Fig. 7), consisting of an original and three copies. The ticket is dated and inserted in a slot provided in the instrument case (Fig. 3). At that time also, the allowable shutdown counter is manually set for the number of dumps equivalent to the month's allowable. This counter runs backwards, and when it reaches zero, the unit shuts down. When the door of the instrument case is closed, the printing dump counter reading is printed on the run ticket.

When the run ticket is to be removed, opening of the instrument case will index the run ticket and print the final reading. The date and integrating temperature counter reading are then written on the run ticket. The number of dumps covered by the run ticket is the difference between the two dump counter readings. The total of the temperatures of all dumps is the difference between the initial and final integrating-temperature-counter readings. Dividing this temperature total by the number of dumps gives the average temperature for the dumps covered by the run ticket.

Strip chart . . . The temperature strip chart (Fig. 3) serves as a check on the temperature integrator and also on the number of dumps, as the strip chart indexes 1/12 in. for each dump, and the increments representing dumps can be counted on the strip chart for the period covered by the run ticket. The temperature of each dump is recorded on the strip chart and the average of these temperatures can be determined and compared, when desired, with the average obtained from the integrating temperature counter. A thermometer well is also provided so the pipeline representative can check the accuracy of the recorder and integrator at any time, with his own thermometer.

Precautions Against Malfunction

The upper and lower floats on the metering tank must physically move the sequence control valve in order for the filling and emptying cycle to continue. The recording and indicating instruments are mechanically actuated by this movement of the sequence control valve by independent linkages.

If by remote possibility one of these mechanical linkages should fail, there is in each case a secondary indicator or recorder from which the data can be obtained. Since these mechanical linkages can be readily inspected, it is improbable that they would wear or otherwise deteriorate to the point of failure without visible indication.

"With the L.A.C.T. unit, it is necessary for pumper to visit the battery only once or twice a month."

The probability of two of the linkages failing between inspections is virtually negligible, certainly less than the possibility of running over a tank of oil or producing into a tank that is running to the pipeline, which can happen with conventional tankage.

Safety floats . . . Referring to Fig. 4, safety floats C and H are provided in the upper and lower necks of the metering tank, so if the liquid level would go beyond the normal float, the unit would shut down. A safety float A is also provided in the upper neck of the storage tank and so connected that if the storage tank becomes full, the lease shuts down. If pilot gas fails at its source, or if pilot gas fails to reach the fill valve or discharge valve, the unit will shut down.

Lining . . . The metering tank is glass lined to reduce the rate of paraffin deposition. It is provided with internal spray piping so it can be conveniently cleaned with heated oil when necessary. A readily removable inspection plate, flush with the inside of the tank, is provided for checking on paraffin deposition. All floats, valve trim, and other actuating parts exposed to crude oil are of corrosion-resistant or noncorrosive material.

Since lease gas can be dirty, corrosive, and subject to freezing, bottled propane is used for instrument gas. Nonbleed pilot valves are used throughout the system, so the monthly propane cost is negligible.

Tamperproof Features

As described above, each time the instrument-case door is opened and each time it is closed the dump-counter reading is printed on the run ticket. The instruments, therefore, are available for inspection and minor maintenance, but if the dump counter is tampered with, there will be a record on the run ticket because the reading when the door is opened would not be identical with the reading when the door is closed. The instrument tubing connections behind the instrument case are in a steel enclosure with a cover which can be sealed to prevent tampering. With this design, it would be impossible to change the dump counter reading without breaking the seal.

Conservation

Steel . . . The Pan American L.A.C.T. unit is in operation on the S. M. McDaniel "B" lease, Sholem Alechem Southwest field, Oklahoma. With a total of 500 bbl. in tankage, the unit replaces four 300-bbl. tanks, resulting in an appreciable saving in steel. On larger leases the saving would be even greater, since the 60-bbl. metering tank can handle 2,000 to 3,000 bbl. per day, depending upon the rate of withdrawal by the pipeline. Since runs can be made every day, or even twice a day if desired, considerable less storage capacity is required than with conventional tanks and manual gaging.

Labor . . . On the above lease, the pumper visits the conventional tank battery approximately 18 times a month to gage the tanks and to verify run tickets. With the L.A.C.T. unit, it will be necessary for him to visit the battery only once or twice a month. On larger leases, this labor saving would be greater.

Reduction of evaporation . . . With the conventional tank battery, it is necessary to open hatches at least once a day to gage the tanks. Opening the hatch reduces the tank pressure from the 2 oz. normally maintained to atmospheric pressure, with the resultant increase in evaporation loss. With the L.A.C.T. unit, there is no necessity for opening the tank except for repair, so that it is not only possible to maintain the pressure on the system at all times, but with the Pan American unit, as designed, it is possible to operate at a pressure as high as 12 psi., resulting in a great decrease in evaporation loss.

Performance

During a 200-dump test of the unit in southern Oklahoma, the corrected volume of oil received in the two 300-bbl. manually gaged test tanks was 0.055 bbl. per dump less than that delivered to them from the metering tank. This difference amounts to 0.092 per cent, and is attributed partly to the fact that the bottom of the 300-bbl. tank deflects less when the bottom gage is taken than when the top gage is taken, and partly to evaporation loss while filling the 300-bbl. tanks.

Here's a practical plate-to-plate program for the medium-speed computer which enables rapid . . .

Automatic Rating of Fractionators

by John C. Reidel
Petrochemicals Editor

THE medium-speed digital computer is becoming the work horse for a number of calculations requiring trial-and-error procedures. Feed it a correctly programed problem and it will spin and toil its way quickly to the answers.

- **Programing** is perhaps best handled by the engineer or engineer-mathematician with an intimate knowledge of the problem being programed. For certain problems much effort and ingenuity may be required in setting up the program.
- **Logical tests** must be incorporated in the program. These are in the nature of instructions for the computer which cannot think but will follow exactly the program prepared for it. Formulation of the logic and experience section is often the most difficult part of preparing a complex program such as the plate-to-plate calculation.
- **Major steps** are outlined here in a practical program, available to industry, for automatic rating of fractionators on a digital computer with magnetic drum storage. This report deals specifically with the I.B.M. deck 1.10 for the 650 computer; some of the modifications of this deck are also noted. The procedure may be adapted for other medium-speed computers.
- **The program** was taken up in detail at a recent conference.[1] The procedure was covered more briefly in earlier A.I.Ch.E. and A.P.I. papers.[2,3]

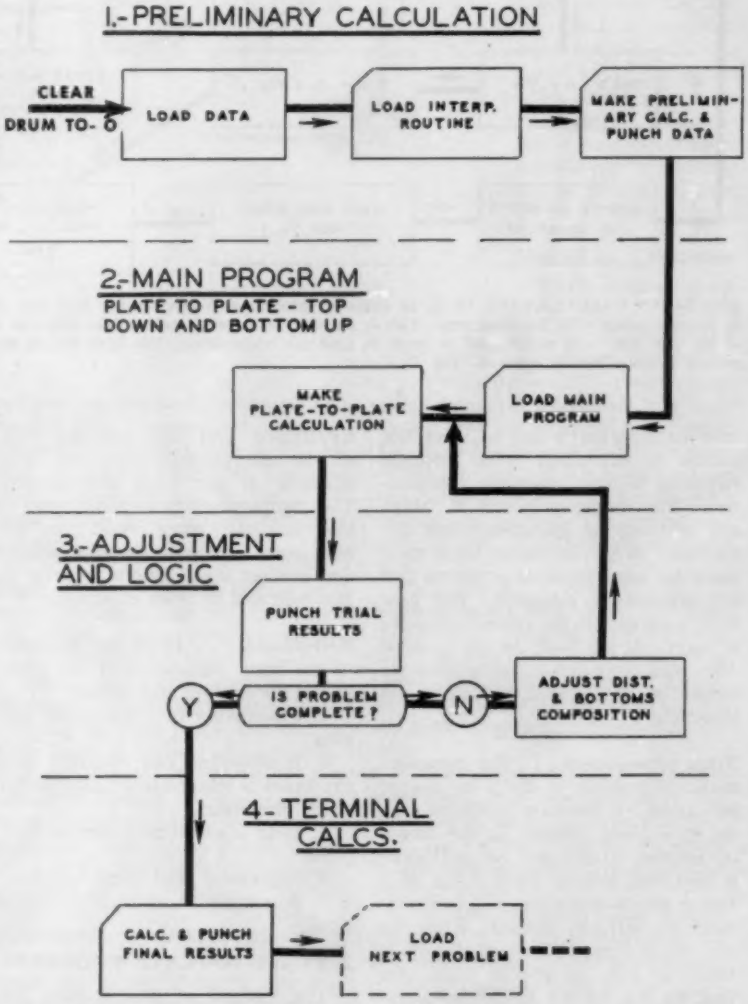
1. USING THE COMPUTER

At Baytown the program has been finding wide utility in fractionator work of Humble Oil & Refining Co., particularly on the naphtha fractionation and rerun facilities of the cat reformer section. One of its modifications was used recently for the 300-plus-plate project for the separation of ethyl benzene by Cosden Petroleum Corp. at Big Spring, Tex.

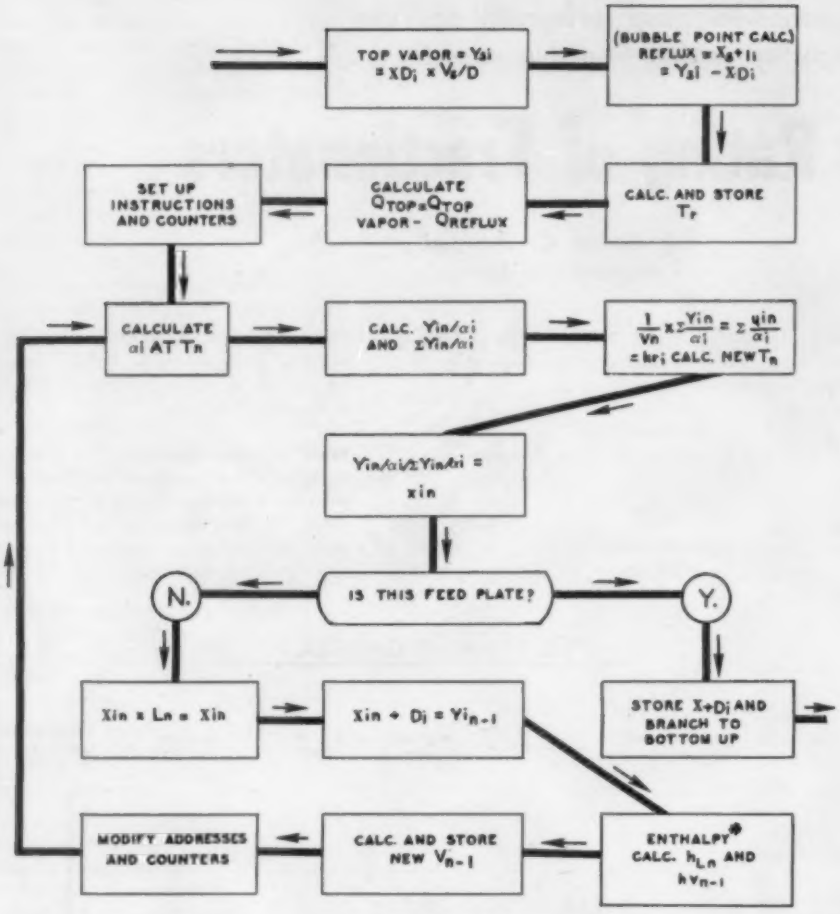
Before getting into the program itself, a few words on the advantages of machine computations may be in order.

A glorified clerk? . . . The obvious advantage of using an electronic computer is that it saves time. This is important, especially when the boss tells you he wants the answer yesterday. But tied in with the saving of time are some other advantages. Now the process design engineer can stop being a glorified clerk; he has more time available for creative work which is his true function.

More rigorous methods . . . Use of rigorous, exact equations and methods becomes more practical with the computer. In this class is the plate-to-plate calculation as outlined 25 years ago by Lewis and Matheson.[4] In the



OVER-ALL PROGRAM showing four main steps in calculation sequence. Fig. 1.



TOP DOWN CALCULATION. *Note on enthalpy calculation: Vapor leaving feed tray is assumed to be in equilibrium with liquid on tray. This is not true for towers handling light ends with large amounts of H_2 and CH_4 and would lead to error in feed-tray temperature. For light ends a more subtle approach to enthalpies is required. Fig. 2.

Source of Report

The plate-to-plate program report presented here is based on a recent conference held at Oklahoma A. & M. College. The conference leader was John S. Bonner, of Bonner & Moore Engineering Associates, Houston. Bonner was graduated from Massachusetts Institute of Technology and did graduate work at California Institute of Technology. He was employed by Humble Oil & Refining Co. at Baytown in 1951. Here Bonner's experience was in operation of the SO_2 extraction plant and naphtha fractionation and rerun facilities. He was responsible for design and evaluation of major plant expansions on both units. In recent years his work has been in the field of machine computations. Some of his work done while at Humble has now been released. This report is the most comprehensive published to date on the I.B.M. 650 plate-to-plate program. Bonner has also done major development work in programing for the I.B.M. 705 computer.

intervening years the engineer has tended to shy away from methods requiring tedious, repetitive computations. The literature is full of "short cut" methods for multicomponent distillation. Some of these have their place for some types of problems and for preliminary estimates. But now it is possible to go plate-to-plate in a hurry. A job such as the Cosden 300 - plus - tray fractionation need no longer be approached with fear and trembling.

Train arrangement . . . The computer makes it possible to dig a lot deeper into some fractionation problems than we ever could before. In the words of Bonner: "Let's say we are given a feed and told to chop it up in a five or six-column train. The permutations are virtually endless. When we are doing computations manually it takes so long to handle each case that we are limited to the investigation of only a small number of cases. Experience and the personal 'feel' of the job strongly influence final selection of the train arrangement. The computer gives us more time to look into many more possibilities. We may come up with an arrangement and product compositions superior to any indicated by prior experience."

Refinements . . . These can be added to the basic framework of the plate-to-plate procedure and include:

1. Preparation of temperature profiles.
2. Equilibrium and enthalpy data expressed as temperature functions for each component.
3. Heat balances around each plate.
4. Automatic feed plate matching.
5. Automatic nonideality corrections.

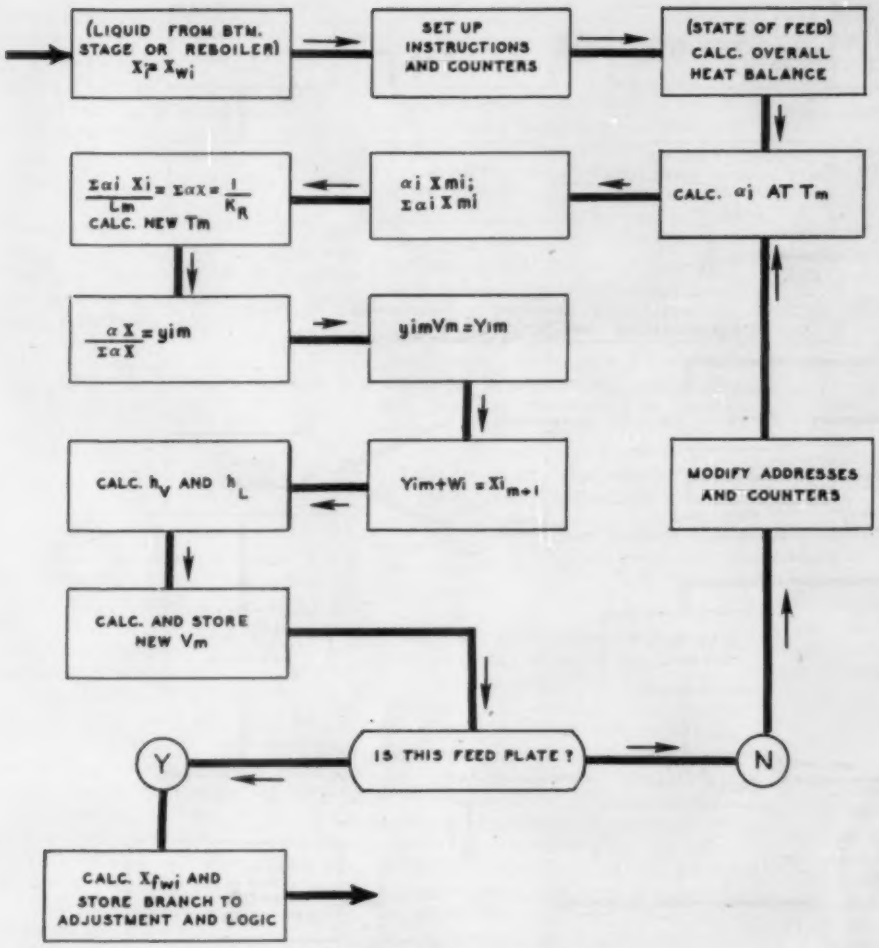
2. PLATE-TO-PLATE PROGRAM

The method of plate-to-plate calculation employed is the conventional "a" method. During each trial tray temperatures are recalculated and stored. Enthalpy and relative volatility data can then be evaluated at the proper temperatures. A vapor-rate profile is calculated and stored for use in the next trial. Handling of nondistributed components, those that appear wholly in distillate or bottoms, is automatic.

It is not necessary to choose key components in the machine computation. Choice of key components is arbitrary and affects the answer obtained.

Limitations . . . The program is designed for single feed, two-product systems. A maximum of 20 components and 98 theoretical stages may be specified. However, the basic program may be modified for special calculations as will be noted later.

What goes in . . . Input data may vary in nature and extent, over a


(LIQUID FROM BTM. STAGE OR REBOILER) Xi= Xwi
SET UP INSTRUCTIONS AND COUNTERS
(STATE OF FEED) CALC. OVERALL HEAT BALANCE
CALC. αi AT Tm
αi Xmi; Σαi Xmi
Σαi Xi / Lm = ΣαX = 1/KR CALC. NEW Tm
αX / ΣαX = yim
yimVm = Yim
MODIFY ADDRESSES AND COUNTERS
Yim+Wi = Xi m+1
CALC. hV AND hL
CALC. AND STORE NEW Vm
IS THIS FEED PLATE?
Y
N
CALC. Xfwi AND STORE BRANCH TO ADJUSTMENT AND LOGIC

BOTTOM UP calculation sequence. Fig. 3.

wide range, according to the problem. In general, this is required:

1. Feed composition, rate, and condition.
2. Enthalpy and equilibrium data.
3. Distillate yield and condition (but not distillate quality).
4. Tower variables such as vapor-rate limitations, feed-plate location and number of stages.

What comes out . . . Included in the answer are:

1. A final material balance, including condenser and reboiler duties.
2. Feed-plate composition.
3. Temperature and vapor-rate profiles.

Liquid and vapor compositions on each plate may be printed out. Or a concentration profile of a given component or group of components can be calculated.

Reflux temperature . . . Normally, reflux is assumed to be at its boiling point. But a particular reflux temperature can be specified and this will be used throughout the problem. This can be done irrespective of whether the distillate is liquid, or a vapor distillate product is called for. The program, however, cannot handle a distillate which is a mixture of liquid and vapor.

Vapor rates . . . Tower loading may be set by specifying: (1) top vapor rate, which is equivalent to specifying reflux rate; (2) vapor rate from a certain stage; this may be used when most heavily loaded stage (bottom stage or plate below the feed in many cases) is known, and (3) maximum vapor rate at any point; this method is slowest — computer must search the entire vapor profile for a maximum value on each trial, then adjust all the rates to bring the maximum rate on specification.

Heat balance . . . During preliminary workups computer time may be cut approximately 40 per cent. Recalculation of vapor rates by heat balance may be bypassed and the computer forced to accept a preset vapor-rate profile. Similarly, recalculations of tray temperature can also be suppressed with the computer forced to follow preset temperature profile.

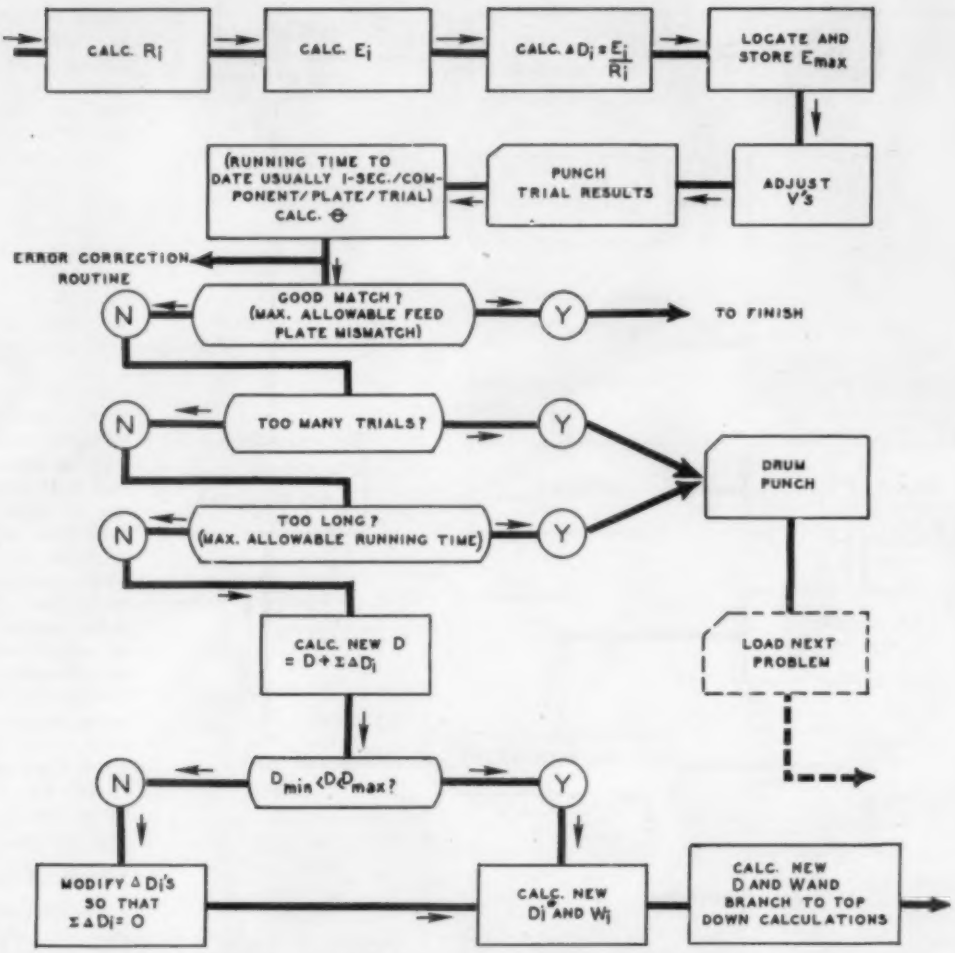
Punchout . . . A single summary card may be punched at the end of each trial. If the computer does not provide a satisfactory answer, a complete set of distillate, bottoms, and feed-plate compositions may be punched after each trial. This enables one to follow the intermediate calculations in detail. A complete plate punchout can also be obtained. The computer repeats the trial on which convergence was obtained, punching complete liquid and vapor compositions on each plate. Obviously this is time consuming; substituting a concentration profile is often advantageous.

Method of Calculation

The over-all program may be divided into four main steps: (1) preliminary calculations, (2) plate-to-plate calculations, (3) adjustment and logic section, and (4) terminal calculations. This is indicated in Fig. 1. The heart of the procedure is the main program loop, consisting of the plate-to-plate calculations and the adjustment and logic section. This will be discussed first.

Main program loop . . . The steps in the main program loop are indicated in Figs. 2, 3, and 4 for "Top Down," "Bottom Up" and "Adjustment and Logic," respectively. The top-down sequence proceeds as follows:

1. Top vapor and reflux compositions and rates are calculated and stored as Y_s and X_{s+1}, respectively.
2. The bubble point of the reflux is calculated and stored as T_R (reflux temperature).
3. A heat balance is made around the top of the tower to determine the total heat leaving via the overhead condensers and distillate product (Q_c).
4. A counter is set up to stop the top-down calculations at the feed plate,


CALC. Ri
CALC. Ei
CALC. ΔDi = Ei/Ri
LOCATE AND STORE Emax
ADJUST V's
PUNCH TRIAL RESULTS
(RUNNING TIME TO DATE USUALLY 1-SEC./COMPONENT/PLATE/TRIAL) CALC. Θ
ERROR CORRECTION ROUTINE
GOOD MATCH? (MAX. ALLOWABLE FEED PLATE MISMATCH)
N
Y
TO FINISH
TOO MANY TRIALS?
TOO LONG? (MAX. ALLOWABLE RUNNING TIME)
DRUM PUNCH
LOAD NEXT PROBLEM
CALC. NEW D = D + ΣΔDi
Dmin < D < Dmax?
MODIFY ΔDi'S SO THAT ΣΔDi = 0
CALC. NEW Di AND Wi
CALC. NEW D AND WAND BRANCH TO TOP DOWN CALCULATIONS

ADJUSTMENT AND LOGIC SECTION. *Note on new D_i: (1) Apply all corrections; (2) slow to zero drift. New D_i is compared with distillate rate range. A zero distillate rate range is permissible but slows computer. This procedure results in a yield-quality curve for tower. Fig. 4.*

and the computer branches to the top-down subloop. (Step 5).

5. The top tray temperature calculated during the last trial is located and α_i evaluated at that temperature.

6. Y_i/α_i and $\Sigma Y_i/\alpha_i$ are calculated.

7. A revised top-tray temperature is calculated, using the relationship $\Sigma y_i/\alpha_i = k_R$ and the equation stored for use in the next trial.

8. Liquid composition on the top tray is calculated by the equilibrium equation:

$$x_{in} = \frac{Y_{in}/\alpha_i}{\Sigma Y_{in}/\alpha_i}$$

9. The tray counter register is decreased by one and tested to see if the feed plate has been reached. If so, x_{in} is stored as x_{fdi} and the program branches to the bottom-up section. If not, it proceeds directly to Step 10.

10. The vapor rate calculated during the last trial for tray n − 1 is located and $L_n = V_{n-1} - D$ is calculated.

11. Vapor composition from the next lower tray is calculated by material balance:

$$x_{in} L_n = X_{in}$$

$$X_{in} + D_i = V_{i\,(n-1)}$$

12. Using the compositions just calculated, a heat balance is made around the top section of the tower. A new value of V_{n-1} is calculated and stored for use in the next trial.

13. The data addresses of the instructions used to locate and store tray temperatures and vapor rates are decreased by one, and the computer branches back to Step 5 to calculate the next set of liquid and vapor compositions.

The bottom-up sequence proceeds in a similar manner; corresponding equations for the two sequences are:

	Top down	Bottom up
Equilibrium	$x_{in} = \frac{Y_{in}/\alpha_i}{\Sigma Y_{in}/\alpha_i}$	$y_{im} = \frac{X_{im}\,\alpha_i}{\Sigma X_{im}\,\alpha_i}$
Material balance	$x_{in} L_n = X_{in}$	$y_{im} V_m = Y_{im}$
	$X_{in} + D_i = Y_{i\,(n-1)}$	$Y_{im} + W_i = X_{i\,(m+1)}$
Temperature	$k_{Rn} = \Sigma\, y_{in}/\alpha_i$	$k_{Rm} = 1/\Sigma x_{im}\,\alpha_i$

The adjustment and logic section (Fig. 4) of the main program loop includes these functions:

1. Adjustment of distillate and bot-

toms composition to secure a better match.

2. Adjustment of vapor rates to obtain specified tower loading.

3. Punching of trial results.

4. Testing for satisfactory feedplate match, excessive number of trials, and excessive running time.

Matching . . . The technique of getting a good match will be dealt with briefly at this point. First calculate the theoretical correction to secure perfect matching, ΔD_i.

$$\Delta D_i = - E_i / R_i$$

where

$$E_i = x_{fdi} - x_{fwi}$$

and

$$R_i = \frac{x_{fdi}}{D_i} + \frac{x_{fwi}}{W_i}$$

This is the amount (moles/hour) by which the distillate rate should be adjusted to secure a perfect match on the next trial, provided that vapor and temperature profiles are not changed. Note that $\Delta D_i = - \Delta W_i$.

Next calculate a new distillate rate. $D_{new} = D_{old} + \Sigma \Delta D_i$. Test this to see if it is within the allowable range of distillate rate fluctuation. If D_{new} is not within that range, the corrections must be modified. This is done so that $\Sigma \Delta D_i$ (adjusted) = 0, and $D_{new} = D_{old}$. If D_{new} is within the acceptable range, the corrections are applied as first calculated and the computer proceeds to the next trial.

The distribution of the lightest and heaviest components exerts the greatest influence on tray temperatures. Therefore corrections are applied preferentially to the extreme components. The middle components may be permitted to go partially or wholly uncorrected during the initial trials. In this manner, proper temperature gradients are established early in the calculation sequence.

Preliminary, terminal calculations . . . These involve many steps which cannot be taken up here. One item of importance in connection with the preliminary calculations is the use of both a fixed decimal and a floating decimal systems. Maximum precision in the fixed decimal arithmetic operations is obtained by automatically rescaling feed rate, feed enthalpy, and vapor-rate profile.

Also in the preliminary calculations, initial distillate and bottoms compositions are assumed. First a perfect split is assumed (with the possible exception of one split component). Then all resulting zero rates are increased to 10^{-40} moles per hour. The assumed compositions are converted to floating decimal notation. (See further below on nondistributed components.)

Nondistributed components . . . In the conventional method of dealing with nondistributed components, the plate on which the component first appears in significant quantities must be estimated. At this stage in the plate-to-plate calculations the component is introduced and builds up as calculations proceed. This method is not well suited to machine computation. By using a floating decimal system for the equilibrium and material-balance calculations nondistributed components are in effect ignored. The floating decimal system makes it possible to carry component rates as low as 10^{-50} moles per hour. This eliminates the necessity for handling the nondistributed components by any special procedure. They are carried along in the computation like the distributed components.

Nonideality corrections . . . In dealing with paraffin - aromatic mixtures correction for nonideality is required. This was true in calculations involving the cat reform and naphtha rerun sections at Baytown where steep aromaticity gradients were encountered.

Aromatics show an increased volatility in the presence of paraffins. Recent studies have shown that this effect is largely independent of the boiling points of the aromatics and paraffins involved. This leads to a good approximation in which, for a known paraffin-aromatic mixture, only two activity coefficients are calculated. These coefficients are functions of the total aromaticity (or paraffinicity) only and independent of other composition variables.

Paraffin and aromatic . . . In applying the activity coefficient correction for the "a" method of plate-to-plate calculations:

$$a = k_i / k_R \times \gamma_i / \gamma_R$$

where γ_R is the activity coefficient of the reference component. If the reference component is an aromatic then we use $\gamma_{par} / \gamma_{arom}$ as a function of the mole fraction of paraffin.

Where naphthenes and olefins are present, these may be combined with the paraffins, so that the two types become aromatics and nonaromatics, rather than aromatics and paraffins.

Inclusion of activity coefficient correlations adds about 20 per cent to the time required for solution of a problem. Recommended coefficients for systems involving C_5-C_{10} aromatics are given in the deck 1.10 instructions. These coefficients were derived by fitting least square curves to over 600 data points, including nine different aromatic - paraffin systems. The standard deviation of γ_i / γ_R was approximately 0.1.

3. AUXILIARY AND PERIPHERAL PROGRAMS

The standard 1.10 deck can handle a maximum of 98 stages. By making minor modifications, it is possible to go to as many as 300 stages.

A 300-stage program . . . Activity coefficient calculations must be sacrificed when the program is modified for 99-150 stages. Both activity coefficient calculations and heat balances must be given up in the deck employed for 151-300 stages.

This latter, deck 1.10-a, was the one used for the Cosden ethyl benzene computations. It has also been used by Humble at Baytown for calculating normal towers. It is useful in studies for optimum instrument location, in which a temperature profile is required. The 1.10-a deck, with heat balance and activity coefficient calculations omitted, and with u.s.a. (usual simplifying assumptions), is a fast procedure. No vapor rate profile is obtained. Since we are forced to use a constant vapor rate but actually do not want a constant rate this is treated as a step function at the feed plate.

Trouble-shooting decks . . . These are decks 1.10-b and 1.10-c, for the cases where no convergence is obtained. In the machine computations discussed here, temperature, vapor rate and product compositions are each calculated on the basis that the other two remain unchanged. Normally the interdependence is not large. But once in a while (especially on light ends near critical conditions) the interdependence becomes too great. The change in the temperature profile negates the improvement in the calculation obtained in successive trials and no convergence is obtained.

To get around this, the 1.10-b deck may be used, for example. In this deck activity coefficient corrections are omitted. In their place, a second temperature profile is punched out. We have two profiles—an assumed profile and a calculated one—and the engineer can compare the error.

Short cut . . . The short-cut method, which employs the usual simplifying assumptions, has been outlined by Bonner.[2] The vapor rate and relative volatility of each component are assumed to be constant. The Fenske equation for total reflux, Underwood minimum reflux equations, and the

Nomenclature:

- C = concentration
- D = distillate, moles/hour
- E = feed-plate mismatch, mole fraction
- F = feed, moles/hour
- h = enthalpy, B.t.u./mole
- k = equilibrium constant, y/x
- L = liquid rate, moles/hour
- N = number of trials
- n = number of components
- Q = heat flow, B.t.u./hour
- Q_c = heat removed by condensers and distillate
- Q_B = heat added by furnace minus heat removed in bottoms
- S = number of stages
- T = temperature
- T_R = reflux temperature
- V = vapor rate, moles/hour
- W = bottoms, moles/hour
- X = liquid composition, moles / hour
- x = liquid composition, mole/ fraction
- Y = vapor composition, moles/ hour
- y = vapor composition, mole/ fraction
- α = relative volatility, k/k_R
- γ = activity coefficient
- θ = running time, seconds
- D, d = distillate
- F, f = feed; feed plate
- i = any component
- L = liquid
- m, n = any stage
- R = reflux; reference component
- S = top stage
- TV = top vapor
- V = vapor
- W = bottoms

Gilliland relation between minimum and actual reflux are employed. The short-cut procedure is accurate for sharp separations. It is more or less approximate for a "sloppy" distillation—in a problem with a number of distributed components. The short-cut program, however, can be a useful auxiliary program for exploratory or preliminary work in which an approximate answer may be good enough.

Other Applications

In the case of a **whole fractionator train,** occasions arise when specifications are changed or towers must be rearranged. A practical program can probably be set up for the I.B.M. 650 or similar computer for such calculations. A train with a maximum of six columns and say 5-10 components might be practical limits for such a program. Physical arrangement of the towers would be specified as data. The short-cut method might be employed for the preliminary work.

Machine computations can also be set up for calculating liquid and vapor traffic to check **tower loading. Tray efficiency** calculations are another possibility.

Design . . . Note that the deck 1.10 is a **rating** deck rather than a complete **design** deck. But it should be possible to set up a design deck for a multicomponent mixture. Given a T.B.P. distillation curve of the mixture, the program can be set up so that the computer begins calculations by dividing the mixture into pseudo-components. Or if the actual components are known, the data can be punched on cards and the cards identified for the particular programs.

Here again the short-cut method may be used for preliminary estimates on alternate cases. The program would be set up to come out with a complete engineering design including the initial and operating costs. It might take several months to work up such a program. But once set up, a complete tower design involving maximum of 10 components could be run by a technician-clerk on the computer in less than a day.

Feed plate optimization . . . In using this 1.10 deck or its modifications the only really tough problem is to locate **"the feed plate that makes the most money."** The 1.10 deck cannot determine directly the optimum feed plate. But ordinarily, three or four cases which differ only in feed-plate locations are sufficient to define the optimum location.

Another auxiliary deck is the 509 deck. This is an Antoine constants program for calculating volatility data. It has been useful, for example, on narrow naphtha cuts such as 200°-210° F. naphtha fractions in cat reforming operations. Correlations could also be developed for light ends. But here a more generalized approach or more sophisticated equations than the Antoine are required.

References

1. Conference on "Use of Digital Computers in Distillation Problems," at School of Chemical Engineering, Oklahoma A. & M. College, Stillwater, January 14-15, 1957.
2. Bonner, J. S., "An Integrated System for Automatic Solution of Distillation Problems," presented at 1956 Pittsburgh meeting of A.I.Ch.E.
3. Bonner, J. S., "Solution of Multicomponent Distillation Problems on a Stored-Program Computer," A.P.I. midyear refining meeting at Montreal, May 15, 1956.
4. Lewis and Matheson, Ind. Eng. Chem. 24, 494 (1932).

Cat Cracker Completes Record Run

A NEW world's record of 1,065 days of continuous operation has been set by one of the catalytic crackers of the Cities Service refinery at Lake Charles, La. In establishing its champion run, extending from April 9, 1954, to March 10, 1957, the "C" unit approached 3 full years of uninterrupted production. The previous record for continuous operation was made in January 1952 by the refinery's "B" unit, which ran for 1,058 days.

During its record run, the "C" unit processed 46,683,438 bbl. of feed stock. It has now been shut down for inspection, necessary repairs, and modernization.

QUANTITATIVE LOG ANALYSIS—6

How to Determine Porosity and Formation Resistivity Factors

by Dr. R. G. Hamilton and Paul Charrin

POROSITY, Φ, is required for formation evaluation and for estimating reserves.

Resistivity methods are employed to determine F which is then converted to Φ by the Humble, Archie, or specifically developed equations. F is then employed in the equation: $R_o = F \times R_w$ to determine the value of R_o, the resistivity of a formation fully saturated with formation water. R_o is used in the Archie relationship for the calculation of water saturation, S_w.

The authors are, respectively, head of Hamilton Well Log Consultants, Tulsa, and president of Perforating Guns Atlas Corp., Houston.

All logging methods for the determination of F and Φ are subject to some limitations and no one method always gives correct values throughout the range of porosity, 1 to 45 per cent. Wherever possible the analyst will employ more than one method. Three methods are presented here. Two more will be presented in Part 7.

Φ from Core Analyses

Weighted averages of porosity determinations from core analyses may be converted to F. Chart 12 may be used to obtain F by the Archie or Humble relationship. Core porosity values of 4 per cent or less are often questionable and it is probable that certain logging methods give more reliable evaluations of average porosity in this range.

Φ and F from the Hydraulic Microsurvey

Wall resistivity logs usually provide very accurate porosity averages for

PRODUCING

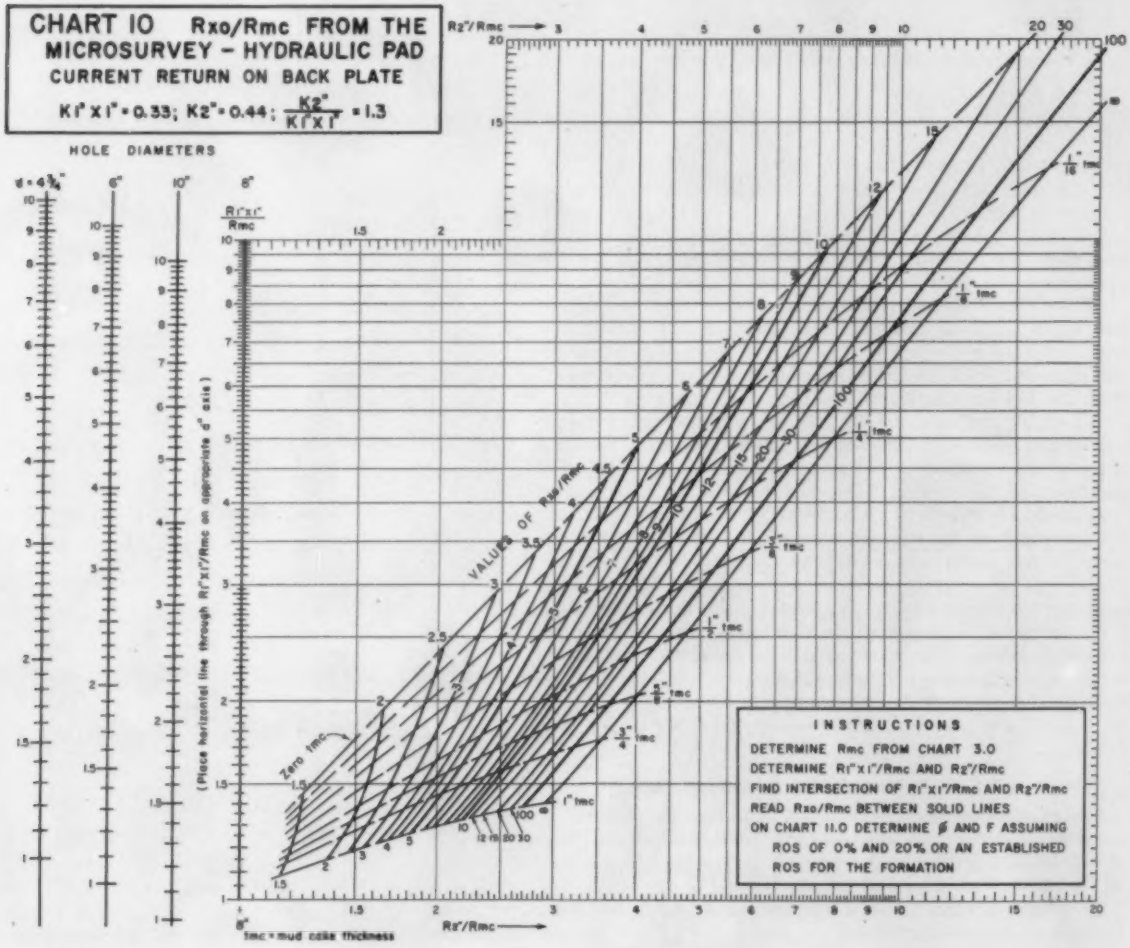


CHART 10 Rxo/Rmc FROM THE MICROSURVEY - HYDRAULIC PAD
CURRENT RETURN ON BACK PLATE
K1" x 1" = 0.33; K2" = 0.44; K2"/K1" x 1" = 1.3
HOLE DIAMETERS
R2"/Rmc
R1"x1"/Rmc
VALUES OF Rxo/Rmc
Zero Imc.
(Place horizontal line through R1"x1"/Rmc on appropriate d" axis)
8" Imc = mud cake thickness
INSTRUCTIONS
DETERMINE Rmc FROM CHART 3.0
DETERMINE R1"x1"/Rmc AND R2"/Rmc
FIND INTERSECTION OF R1"x1"/Rmc AND R2"/Rmc
READ Rxo/Rmc BETWEEN SOLID LINES
ON CHART 11.0 DETERMINE Φ AND F ASSUMING
ROS OF 0% AND 20% OR AN ESTABLISHED
ROS FOR THE FORMATION

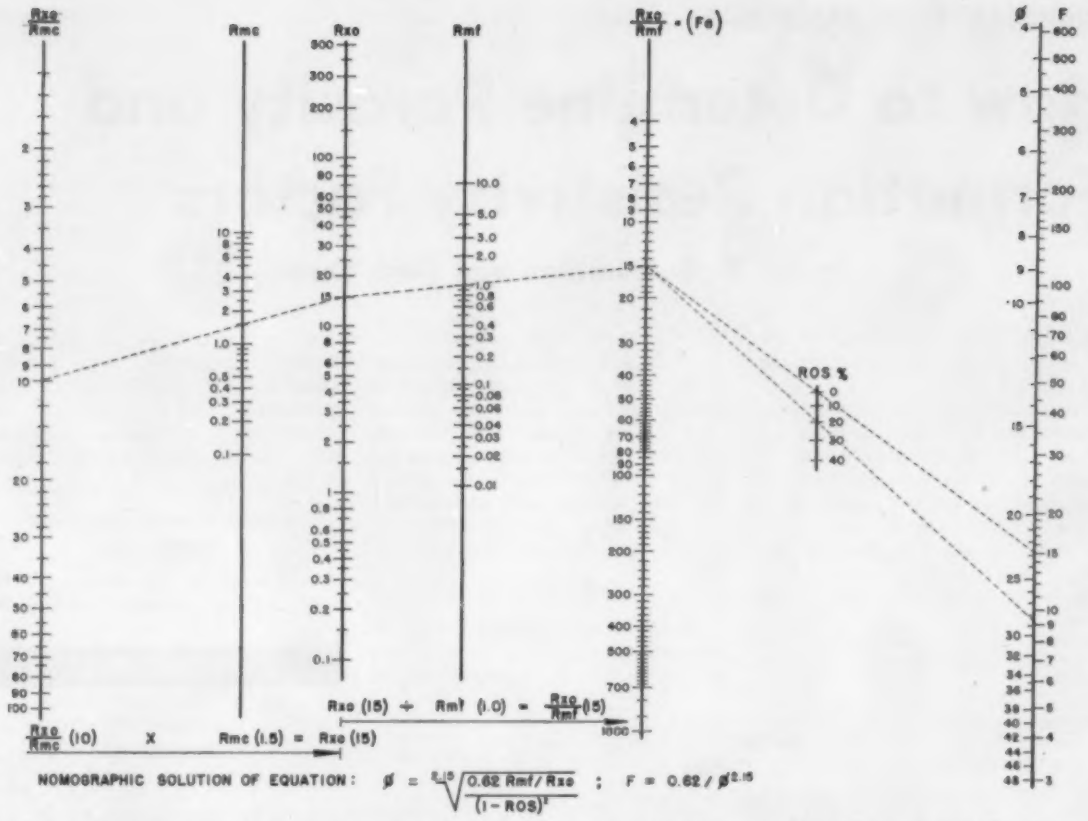

Rxo/Rmc
Rmc
Rxo
Rmf
Rxo/Rmf = (Fo)
ROS %
Rxo/Rmc (10) X Rmc (1.5) = Rxo (15)
Rxo (15) ÷ Rmf (1.0) = Rxo/Rmf (15)
NOMOGRAPHIC SOLUTION OF EQUATION: Φ = ∛(0.62 Rmf/Rxo / (1 − ROS)²) ; F = 0.62 / Φ^2.15

CHART 11—This nomograph determines porosity and formation factor from Microsurvey measurements on nonshaly formations.

thick and thin zones when (1) porosity is greater than 25 per cent, (2) mud cakes are not too thick, and (3) the formation is sufficiently flushed to obtain R_{xo}. Determinations are usually less accurate when the porosity is less than 20 per cent or mud cakes are unusually thick. Below 8 per cent, porosity determinations are poor by all wall resistivity logs.

Chart 10 for the hydraulic Microsurvey is employed to obtain R_{xo}/R_{mc}. Values of the 1 by 1-in. and 2-in. curves at a selected level are divided by R_{mc}. R_{mc} is obtained from an actual mud measurement or, in the absence of this, from Chart 3 (Part 2). Follow instructions on Chart 10.

Chart 11 converts R_{xo}/R_{mc} to R_{xo}/R_{mf} through a simple nomograph. The right side of the chart determines per cent porosity for various residual oil saturation values (ROS). Experience determines what ROS value to employ. Usually Φ is determined for 0 and 20 per cent ROS. F and Φ of Chart 11 are expressed by the Humble relationship. They may be converted to the Archie relationship by Chart 12.

Sources of error in Φ from wall-resistivity logs are due generally to (1) errors in R_m, R_{mf} and R_{mc}, (2) thick mud cakes, (3) the effect of shale and conductive solids, and sometimes to, (4) indeterminate hole diameter due to formation caving and subsequent building up of a thick mud cake. Empirical charts have been introduced for most methods wherein the $R_{2'}$ and R_m values are employed for a rough estimate of per cent porosity.

Φ and F from Noninvaded Resistivity Curves

From the equation, $F = R_o/R_w$, F may be obtained in nonshaly, 100 per cent water-bearing formations. R_o is determined accurately from a noninvaded normal or lateral curve. R_w is obtained as described previously.

The nomographic Chart 12 determines Φ and F for either Humble or Archie relationship.

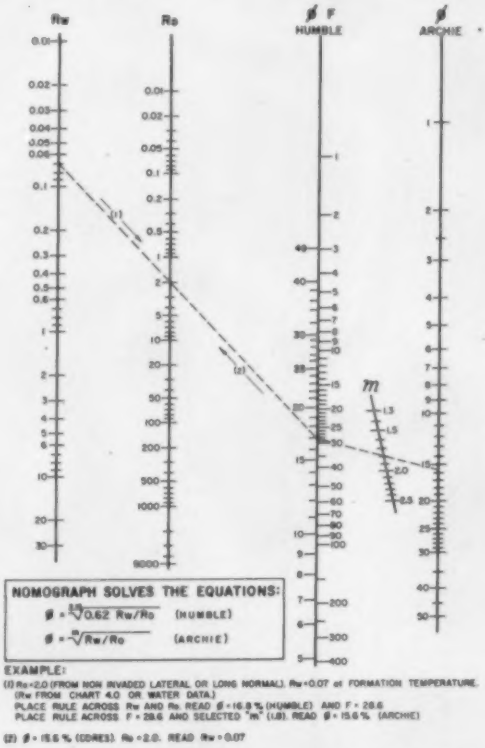
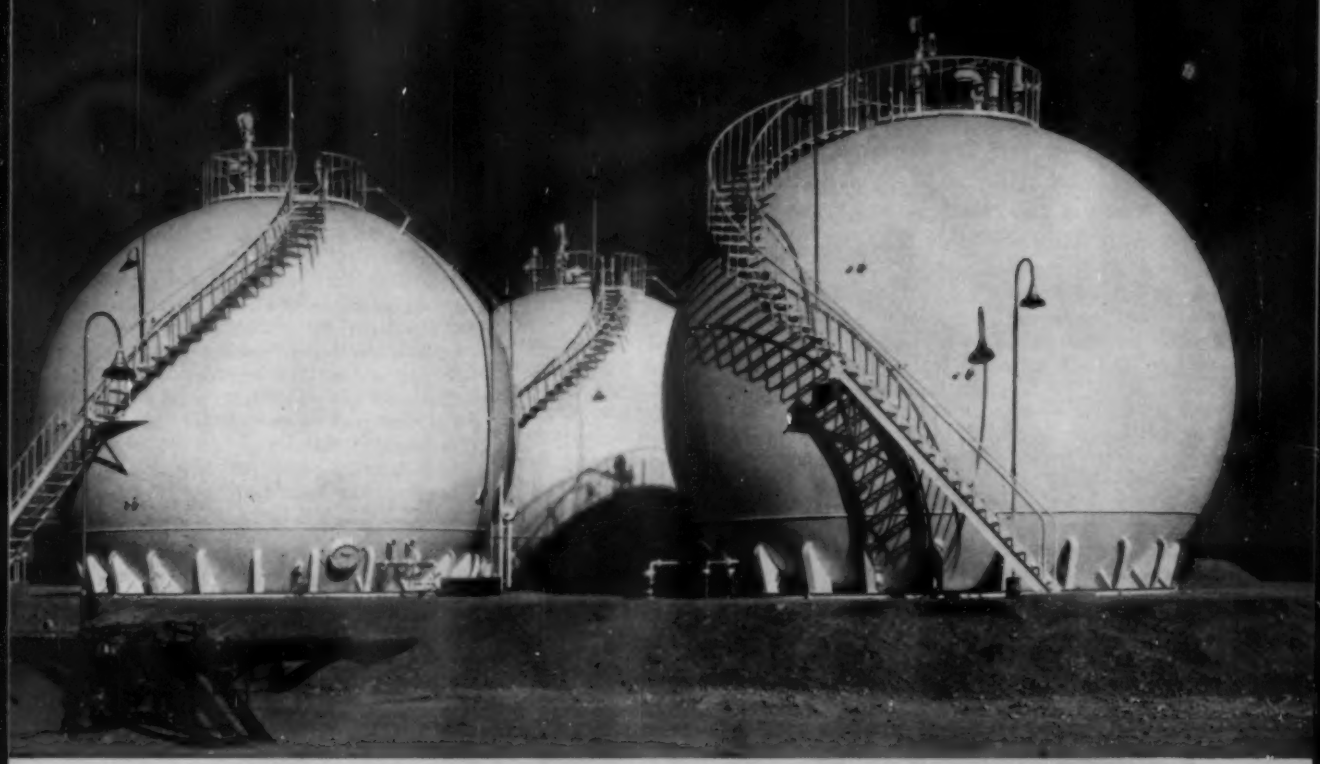

Rw
Ro
Φ F HUMBLE
Φ ARCHIE
m
NOMOGRAPH SOLVES THE EQUATIONS:
Φ = ∛(0.62 Rw/Ro) (HUMBLE)
Φ = √(Rw/Ro) (ARCHIE)
EXAMPLE:
(1) Ro = 2.0 (FROM NON INVADED LATERAL OR LONG NORMAL). Rw = 0.07 at FORMATION TEMPERATURE. (Rw FROM CHART 4.0 OR WATER DATA.)
PLACE RULE ACROSS Rw AND Ro. READ Φ = 16.8 % (HUMBLE) AND F = 29.6
PLACE RULE ACROSS F = 29.6 AND SELECTED "m" (1.8). READ Φ = 15.6 % (ARCHIE)
(2) Φ = 15.6 % (CORES). Ro = 2.0. READ Rw = 0.07

CHART 12—Determines porosity from noninvaded resistivity curves of nonshaly, 100 per cent water-bearing formations.

HORTONSPHEROIDS...

the natural way to store natural gasoline and stop evaporation loss



Hortonspheroids® are used to store liquids that are too volatile to hold at atmospheric pressure. They prevent breathing and boiling losses and reduce filling losses to a practical minimum. No vapor can be lost as long as the internal pressure does not exceed the settings of the pressure relief valves.

The three 3,500-bbl. Hortonspheroids above were erected for the storage of natural gasoline at the Texas Natural Gasoline Corporation, Perkin's Plant, Coke County, Texas. They are designed for 45 lbs. per sq. in. working pressure and were pickled and painted by the Horton® Pickling Process, an efficient means of removing mill scale from steel to provide a better bond between paint and metal.

Hortonspheroids are built in capacities to 120,000 bbls. and for pressures to 100 lbs. per sq. in. in smaller sizes. For further information please write our nearest office.

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Horton Steel Works Limited, Toronto. Chicago Bridge & Iron Company Ltd., Caracas.
Chicago Bridge Limited, London. Sociedade Chibridge de Construcoes Ltda., Rio de Janeiro.

Above: Three 3,500-bbl. Hortonspheroids, built by CB&I for the Texas Natural Gasoline Corporation, Perkin's Plant, Coke County, Texas. The structures are 35 ft. in diam. and were designed for a working pressure of 45 lbs. per sq. in.

CB&I

Tests shed new light on

Pipeline Pressure-Surge Problems

"Future applications of this method should aid designer in predicting points of extreme fluctuating pressure, resulting in better over-all designs and appreciable savings."

by Robert D. Kersten and Edwin J. Waller

Part 1 of Two Parts

PRESSURE surges have long been the bane of the pipeliner's existence. In spite of the advances in technology and equipment, surge problems for the most part have remained unsolved and are generally regarded as a necessary evil. Undoubtedly, this has been so because the various water-hammer theories were not fundamental enough in their approach to permit widespread application to a variety of pumping situations. In addition, many commercial desurgers or pulsation dampeners, while helpful in some cases, are frequently detrimental in others.

The net result is that the pipeliner is still concerned with:

- **The inability to predict** the points of extreme fluctuating pressure in a pumping system, thereby resulting in the overdesign of the entire system.
- **Breakdowns** of the pumping system from elastic failure of the pipes and pumps due to extreme fluctuating pressures.
- **Loss of revenue** because "surges" necessitate the establishment of a line limit below the normal rating of the equipment.

This paper will outline a method of analysis based on a fundamental mathematical approach and will demonstrate the validity of this method through application to an actual field-scale pumping pipeline system. Future applications of this method should aid the designer in predicting points of extreme fluctuating pressure, resulting in better over-all designs and appreciable savings.

Reduced to its most basic concept, pipelining is transportation. Transportation is movement, and moving objects have inertia and resistance. Therefore, each investigator in this field has succeeded only to the extent to which he has applied fundamental engineering techniques.

PIPELINING

Developing a Method of Analysis

Previous investigations . . . The earliest noteworthy contributions to the water-hammer or pressure-surge theory were those of Allievi[1] and Joukowski.[2] Joukowski postulated the classic water-hammer formula for the increase in pressure due to the extinguishing of a given velocity of flow. The work of Allievi represented the first fundamental mathematical approach to variable flow. Although the basic differential equations of variable flow were not explicitly solved for the steady-state case until nearly 50 years later, the importance of Allievi's work should not be overlooked.

Many of the water-hammer and pressure-surge studies worthy of note draw heavily on the work of Allievi and Joukowski. The most significant contributions in this field have been summarized by the A.S.M.E. symposium on water hammer[3] and by Wyatt[4] and will not be repeated here. It should be noted, however, that for the most part the methods of analysis outlined in these papers were of a semiempirical nature and lean heavily on graphical techniques.

Results of recent research . . . Waller[5,6] proposed a solution to the fundamental equations of variable flow postulated by Allievi,[1] Rayleigh,[7] Lamb,[8]

A new approach to an old problem . .

This provocative article deals with an aspect of a 5-year study of surge phenomena based on recent mathematical concepts which parallel those for electric waves. More complete information will be available later this year.

Formulas are yet to be devised for applying the principles to pipeline design. The first design application will probably be to piping systems with reciprocating pumps. The real significance of the concept, however, is the promise it gives for gaining a better understanding of surge phenomena.

This should aid in diagnosing the causes of some surges which are now baffling. Entirely different surge results are coming from conditions which appear to be identically the same. So far only unsatisfactory "cut and try" empirical methods have been available.

The basic theory has been substantiated through verification in laboratory and field tests. The study as a whole is concerned with surges as broad phenomena of all frequencies of pressure variations of steady and unsteady flow.

Pressure variations . . . Pulsations may be defined as pressure variations introduced from outside the piping system which are not the result of characteristics of the line. These may come from a cyclic mechanism such as a reciprocating pump or from the opening and closing of a valve. Pulsation waves are general cyclic perturbations above and below a mean flow. These perturbations are small in relation to the volume current. Both are amenable to the same treatment.

This entirely mathematical approach comes nearest to being a completely scientific conception. It is not revolutionary. But it is so new that it must yet be put in shape to make it a design tool.

Analog study or a simpler mathematical approach with the use of digital computers may implement the concept for application to practical pipeline problems.

The subject is so big it can't be taken in one bite. A paper to be presented at the A.S.M.E. meeting at Tulsa in September will cover more specific application.

How Symbols Are Used in This Article

The symbols listed below are briefly defined, and the descriptive units refer to the gravitational (technical) system. "F" is a force usually in pounds, "L" is a length usually feet, and "T" is time usually seconds. The mass unit is the slug = 32.2 lb./g.

A = area. L^2, sq. ft.
A = as a subscript refers to a particular point in pipeline system; see appropriate sketches.
a = the velocity of propagation of the pressure wave. LT^{-1}, or ft. per sec.
B = as a subscript refers to the stub or branch in the pipeline system.
D = the diameter of the pipe for the pipeline analysis. L, ft.
D = the diameter of the liner for the pump analysis, L, ft.
d = the diameter of the piston rod. L, ft.
E = as a subscript refers to equivalent parallel combination of branch and main line impedances.
f = the frequency. T^{-1}, cycles per second.
g = the gravitational constant. LT^{-2}, 32.2 ft. per sec.^{2}
i = as a subscript refers to internal mechanism of pump.
$j^2 = -1$, i.e., j is complex operator $= (-1)^{1/2}$.
l = length. L, ft.
m = an integer.
m = as a subscript refers to the main line.
n = the exponent of **U** for mean flow.
N_r = the Reynold's number.
p = as a subscript refers to the equivalent impedance at the pump (i.e., parallel combination of sending end and internal pump impedances).
p = the mean pressure that causes a mean flow in a finite length of line. FL^{-2}, lb. per ft.^{2}
P_{sub} = the vertical representation of the standing wave pressure amplitude. The subscript denotes the point in question. FL^{-2}, lb. per ft.^{2}
q = the mean rate of flow. L^3T^{-1}, cu. ft. per sec.
Q_{sub} = the vectorial representation of the volume current or harmonic flow rate. L^3T^{-1}, cu. ft. per sec.
Q_g = the volume current generated by the oscillating piston of the reciprocating pump. L^3T^{-1}, cu. ft. per sec.
r = as a subscript refers to the receiving end of the pipeline.
r = the radius of the crank arm or the eccentric of the crankshaft. L, ft. or one-half of stroke.
s = as a subscript refers to the sending end of the pipeline. This is usually at the pump end.
s = the stroke of the piston (2r). L, ft.
t = time. T, sec.
U = the mean velocity of the fluid in the pipeline. LT^{-1}, ft. per sec.
v_p = the velocity of the piston in a reciprocating pump. LT^{-1}, ft. per sec.
x = the distance from the receiving end or sending end. See appropriate sketches. L, ft.
x = used as a second subscript to denote existence of several harmonics.
Z_c = the characteristic impedance of the pipeline. $FL^{-5}T$, lb. sec. per ft.^{5}
Z_{sub} = the complex quotient of the hydromotive pressure (P) and hydraulic volume current (Q) at any point in the system denoted by the subscript. $FL^{-5}T$, lb. sec. per ft.^{5}
α = the attenuation constant. L^{-1}, numeric per ft.
β = the phase constant. L^{-1}, radians per ft. or degrees per ft.
γ = the propagation constant $\alpha + j\beta$. L^{-1}.
ρ = the density of the fluid. $FL^{-1}T^2$ per L^3 or $FL^{-4}T^2$, slugs per ft.^{3}
ϕ = the phase angle of the polar form of the vectors (degrees).
ω = the circular speed of the rotating vectors; also the angular velocity of the crankshaft. L^{-1}, radians per second.
$\approx$ = this sign as used herein means approximately equals.

NOTE: All capital P's, Q's, and Z's in equations in this report refer to vector quantities. When a single subscript is used, it refers to a particular position. When two subscripts are used, the first refers to position, the second to the particular harmonic in question.

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and others. The basic differential equations found in this analysis were of the same form as those found in the transmission of energy by heat, sound, and electricity. It was natural, therefore, that use should be made of the mathematical tool of wave analysis. In the process of solution of the differential equations, the assumption was made that the principle of superposition was valid for this case. The resulting solution consisted of a transient term and a steady-state term.

The transient term was found to be the water-hammer solution and obviously damps out after a period of time. Analyzing the steady-state term

THE AUTHORS

R. D. KERSTEN

E. J. WALLER

Robert D. Kersten, research engineer with Carter Oil Co., Tulsa, holds B.S. and M.S. degrees from Oklahoma A. & M. He was hydraulic engineer with the U. S. Department of Interior from 1949 to 1953 and research associate and assistant professor of civil engineering at A. & M. from 1953 to 1956. He is an associate member of A.S.C.E. and a registered professional engineer in Oklahoma.

Edwin J. Waller, associate professor of civil engineering at Oklahoma A. & M., received a B.S. in general engineering in 1949 and a M.S. in 1951 from A. & M. Since 1951, he has been with the school of civil engineering except for a year (1955-56) with Carter Oil Co.'s research laboratories in Tulsa. A member of A.S.C.E. and A.S.M.E., Professor Waller has had much experience as a consultant in mechanics and fluid dynamics and is now engaged in this work.

Paper presented before the Pipeline Division, American Society of Civil Engineers, Jackson, Miss.

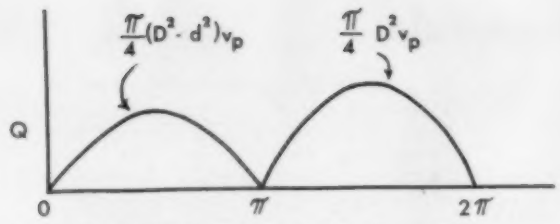

Fig. 1—Discharge from double-acting cylinder.

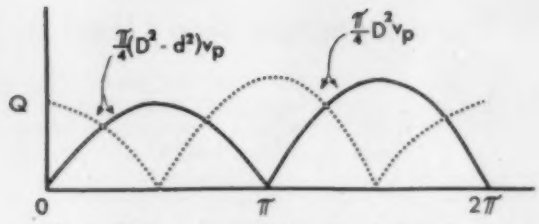

Fig. 2—Discharge from double-acting duplex pump.

independently, the following result was obtained for the fluctuating pressure (P) and the alternating volumetric flow rate or volume current (Q) at any point "x" distance from the receiving end:

$$P_x = P_r \text{ Cosh } \gamma x + Q_r Z_c \text{ Sinh } \gamma x \quad (1)$$

and

$$Q_x = Q_r \text{ Cosh } \gamma x + (P_r/Z_c) \text{ Sinh } \gamma x \quad (2)$$

where Z_c and γ are constants defined as:

$$Z_c = \rho a/A \quad (3)$$

$$\gamma = \alpha + j\beta \quad (4)$$

where α is the attenuation coefficient and β is the phase constant. The reduction in magnitude of the wave as it travels down the pipeline may be determined from the attenuation coefficient:

$$\alpha = \frac{p\,n}{2\,l\,U\,a} \quad (5)$$

Beta determines the change in phase between the pressure and volume current as the pressure wave travels in the pipeline:

$$\beta = \omega/a \quad (6)$$

The reader is referred to the original work for the complete derivation of the above equations. The primary interest herein is the application of this method of analysis to a full-scale field installation.

Equations 1 and 2 will be recognized as being of the same form as the classical wave equations of acoustics and electrical engineering, and an electrical-hydraulic analogy becomes evident. Therefore:

$$P_x = Q_x Z_x \quad (7)$$

i.e., Ohm's law for the hydraulic circuit becomes the defining equation for the impedance (Z) to the alternating flow. Equations 1 through 7 form the basis of the analysis of a pumping system. The recognition of the electrical analogy permits the formulation of a method of hydraulic circuit analysis similar in many respects to electric-circuit analysis.

The pump equation . . . Inspection of Equation 7 reveals that, once any two of the three quantities are known at a particular point in the pipeline system, the third may be calculated. Then, by application of Equations 1 and 2, the fluctuating pressure and alternating volume current may be calculated at other points in the system. Pressure is a measurable quantity. The volume current and impedance are not.

However, the use of a reciprocating pump on a pipeline system gives rise to an alternating periodic volume current or volumetric flow rate. Since the flow is periodic, it may be analyzed by Fourier series methods and expressed in terms of a trigonometric series involving harmonics of a basic frequency. The response of the system to the various harmonics may then be determined; and, using superposition, the effects of all the harmonics may be found if desired.

When the connecting-rod length, l, is not relatively long compared to the crank arm, r, the piston motion is not simple harmonic, and the piston velocity for constant ω becomes:

$$v_p = ds/dt = r\omega [\text{Sin } \omega t + (r/2) \text{ Sin } 2\omega t] \quad (8)$$

The variable flow rate is then:

$$Q = A_c v_p \quad (9)$$

where A_c is the area of the cylinder. For a double-acting cylinder:

$$A_c = \pi D^2/4 \text{ for } 0 < \omega t < 180°$$

and

$$A_c = \frac{\pi (D^2 - d^2)}{4} \text{ for } 180° < \omega t < 360°$$

where D is the liner diameter and d is the diameter of the piston rod. Fig. 1 is a plot of the discharge from one double-acting cylinder.

The Fourier series solution for this case, referred to head-end dead center, is:

$$Q = \frac{\pi r \omega}{4}\left\{\frac{2D^2 - d^2}{\pi} - d^2\left[\frac{2r}{3\pi\ell}\text{ Cos } \omega t + \frac{1}{2}\text{ Sin } \omega t\right] + \frac{(2D^2 - d^2)}{\pi}\left[\frac{\pi r}{4\ell}\text{ Sin } 2\omega t - \frac{2}{3}\text{ Cos } 2\omega t\right] + \frac{rd^2}{2\pi\ell}\sum_{m=3,5,7,9.}\frac{4}{m^2-4}\text{ Cos } m\omega t - \frac{(2D^2 - d^2)}{\pi}\sum_{m=4,6,8.}\frac{2}{m^2-1}\text{ Cos } m\omega t\right\} \quad ..(10)$$

The effect of referring Equation 10 to crank-end dead center is to reverse the algebraic sign of the odd harmonics.

For two double-acting cylinders, i.e., a double-acting duplex pump such as the Gaso pumps at the test station with one cylinder 90° ahead of the other, as shown in Fig. 2, and with the first cylinder referred to head-end dead center, the Fourier series analysis gives:

$$Q = \frac{\pi r\omega}{4}\left\{\frac{4D^2 - 2D^2}{\pi} - d^2\left[\frac{r\sqrt{2}}{3\pi\ell}\text{ Sin}(\omega t + 135°) + \frac{\sqrt{\pi}}{4}\text{ Sin}(\omega t + 45°)\right] + \frac{rd^2}{2\pi\ell}\left[\sum_{m=3,7,11\ldots}\frac{4\sqrt{2}}{m^2-4}\text{ Cos}(m\omega t + 45°) + \sum_{m=5,9,13\ldots}\frac{4\sqrt{2}}{m^2-4}\text{ Cos}(m\omega t + 135°)\right] - \frac{(2D^2 - d^2)}{\pi}\left[\sum_{m=4,8,12\ldots}\frac{4}{m^2-1}\text{ Cos } m\omega t\right]\right\} \quad (11)$$

Similar equations may be developed for any multicylinder double-acting pump referenced to head-end or crank-end dead center by superimposing the

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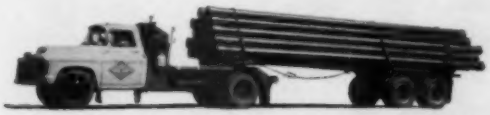

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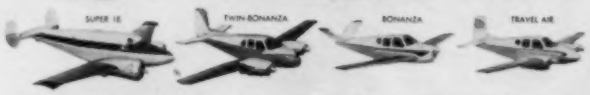

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effects of the required number of double-acting single cylinders (Equation 10) properly phased.

It should be noted that the first term in Equations 10 and 11 is the mean-flow (q) component, while all the other terms are the variable-flow components. The magnitude of all odd harmonics above the third and all even harmonics above the eighth is normally small in comparison to the predominant fourth harmonic. Neglecting these terms, Equation 11 may be reduced to:

$$Q = \frac{\pi r \omega}{4}\left\{\frac{4D^2-2d^2}{\pi} - d^2\left[\frac{r\sqrt{2}}{3\pi l}\sin(\omega t + 135°) + \frac{\sqrt{2}}{4}\sin(\omega t + 45°)\right]\right.$$

$$\left. + \frac{rd^2}{2\pi l}\,\frac{4\sqrt{2}}{5}\cos(3\omega t + 45°) - \frac{(2D^2-d^2)}{\pi}\left[\frac{4}{15}\cos 4\omega t + \frac{4}{63}\cos 8\omega t\right]\right\} \quad (11a)$$

The following quantities are applicable to the Gaso pumps at the test station:

$D = 5\frac{1}{2}$ in. $= 0.458$ ft.
$d = 2$ in. $= 0.167$ ft.
$r = 6$ in. $= 0.5$ ft.
$\omega = (\text{r.p.m.})\,2\pi/60 = 0.105\,(\text{r.p.m.})$
$l = 33\frac{1}{2}$ in. $= 2.742$ ft.

Equation 11a then reduces to:

$$Q = 0.0103\ (\text{r.p.m.}) + 0.000816\ (\text{r.p.m.})\ \sin(\omega t - 128.9°)$$
$$+ 0.000221\ (\text{r.p.m.})\ \sin(3\omega t + 135°)$$
$$+ 0.00137\ \ (\text{r.p.m.})\ \sin(4\omega t - 90°)$$
$$+ 0.000325\ (\text{r.p.m.})\ \sin(8\omega t - 90°) \quad (11b)$$

Equation 11b is used throughout the analyses in the following chapters as the value of the variable volume current, Q_g, generated by the pump.

For a pump with no return rod in the cylinder (i.e., d = 0), Equation 10 for one double-acting cylinder becomes:

$$Q = \frac{\pi r \omega}{4}\left\{\frac{2D^2}{\pi} + \frac{2D^2}{\pi}\left[\frac{\pi r}{4l}\sin 2\omega t - \frac{2}{3}\cos 2\omega t\right]\right.$$
$$\left. - \frac{2D^2}{\pi}\sum \frac{2}{m^2-1}\cos m\omega t\right\}$$
$$m = 4, 6, 8 \ldots\ldots \quad (12)$$

and Equation 11, for two double-acting cylinders 90° apart, reduces to:

$$Q = \frac{\pi r \omega}{4}\left\{\frac{4D^2}{\pi} - \frac{2D^2}{\pi}\sum \frac{4}{m^2-1}\cos m\omega t\right\}$$
$$m = 4, 8, 12 \quad (13)$$

Equations may be developed for any multicylinder double-acting pump by superimposing the effects of the required number of double-acting cylinders (Equation 12) properly phased.

References

1. Allievi, Lorenzo, "General Theory of Perturbed Flow of Water in Conduits," Milan, 1903. Translated by E. E. Halmos, 1925.

2. Joukowski, "Water Hammer," Proceedings of the American Water Works Association, 1904.

3. "Symposium on Water Hammer," Hydraulics Division of American Society of Mechanical Engineers, 1933.

4. Wyatt, Harry M., "Pulsation Absorbers — Their Design and Application," A.S.M.E. paper No. 56-Pet-31, Sept. 23, 1956.

5. Waller, E. J., "A Theoretical Study of Impedance Matching as Applied to Surge Suppression Instruments in Hydraulic Systems," master's thesis, Oklahoma A. & M. College, Jan. 1951.

6. Waller, E. J., "Fundamental Analysis of Unsteady Pressure Variations in Pipeline Systems," Publication No. 92, Oklahoma Engineering Experiment Station, Oklahoma A. & M. College, Stillwater, May 1954.

7. Lord Rayleigh, "Theory of Sound," 1929.

8. Lamb, Sir Horace, "Hydrodynamics," Dover Publications, New York, 1945.

BOOKS

SYMPOSIUM ON CORONA published by American Society for Testing Materials, 1916 Race Street, Philadelphia 3. 32 pp. $1.25.

The deleterious effects of corona on organic electrical insulation have been known for years. Considerable research and investigational work has been done by manufacturers and users of organic materials. Evaluation of stability in applications where operating voltage gradients approach ionizing levels have been made. A committee (D-9) on electrical insulating materials initiated research and standardization of methods of corona detection and material evaluation in this field.

One of the accomplishments of this work was a Symposium on Corona.

CORROSION: A Compilation by Mars G. Fontana. Published by Press of Hollenback, Columbus, Ohio. 240 pp. $5.95.

A compilation of the monthly columns on corrosion written during the past 10 years for Industrial and Engineering Chemistry. The articles are grouped into seven chapters, namely (1) Nature and Extent, (2) Eight Forms of Corrosion, (3) Eight Methods for Combatting Corrosion, (4) Corrosion Testing and Evaluation, (5) Materials, (6) Environments, ahd (7) High Temperature Oxidation. A very detailed index is added to put the information in readily usable form.

Practically all metals and alloys, and some nonmetallics, used for corrosion applications are covered. Methods and detailed procedures for laboratory and plant testing are described. Iso-corrosion charts, which show corrosion as a function of temperature and concentration of acids, are presented. Causes and cures for many actual plant problems are described.

CARTOGRAPHY by Hubert A. Bauer. Published by Bellman Publishing Co., Box 172, Cambridge 38, Mass. 33 pp., paper back, $1.

One of a series of vocational and professional monographs being published by Bellman. Bauer is an expert cartographer and a professor of geography at Villanova University. This monograph includes a history of map making, qualifications for employment in the field, necessary training required, methods of entry, opportunities for advancement, earnings, general trends in the industry, and sources of further information.

NEW TECHNOLOGY AND THE SUPPLY OF PETROLEUM, by Miller B. Spangler, R.F.D. 1, Yorktown Heights, N. Y. 299 pp., $3.50.

The study is the outgrowth of the author's special interests and educational background. Technological change, according to the author, is probably one of the more important factors affecting political, social, and economic life. The study is centered on the problem of estimating the contributions of new technology to the supply of petroleum. Tentative estimates of oil supply are largely supported by facts, data, and authoritative opinion, rather than being the author's estimates alone.

STRATIGRAPHY AND STRUCTURAL DEVELOPMENT OF THE SALINA BASIN AREA, by Wallace Lee. Published by State Geological Survey of Kansas, University of Kansas, Lawrence. Bulletin 121. 167 pp.

This report describes the stratigraphy and structural history of the Salina basin in Kansas and adjoining areas. It will be of particular value to those who are interested in the oil possibilities of the Salina basin. The author covers the regional and local stratigraphy of the individual formations present. Detailed cross-sections and maps are included.

THERMODYNAMIC PROPERTIES OF THE ELEMENTS. Published by The American Chemical Society, 1155 Sixteenth Street N. W., Washington 6, D. C. $5.

This is an excellent systematic presentation of thermodynamic data. Tabulated values of the heat capacity, heat content, entropy, and free energy function of the solid, liquid, and gas states of the first 92 elements are given for the temperature range 298° to 3,000° K. Auxiliary data include temperatures and heats of transition, melting, and vaporization and vapor pressures. Literatures sources are listed. The published values have been analyzed and are supplemented by estimates when experimental data are lacking. With the aim of providing the basic data for the elements needed in the calculation of the thermodynamic properties of chemical compounds, the tables were compiled by D. R. Stull and G. C. Sinke at the Thermal Laboratory of Dow Chemical Co. These up-to-date tables especially fill the need for data in the increasingly important high-temperature region.

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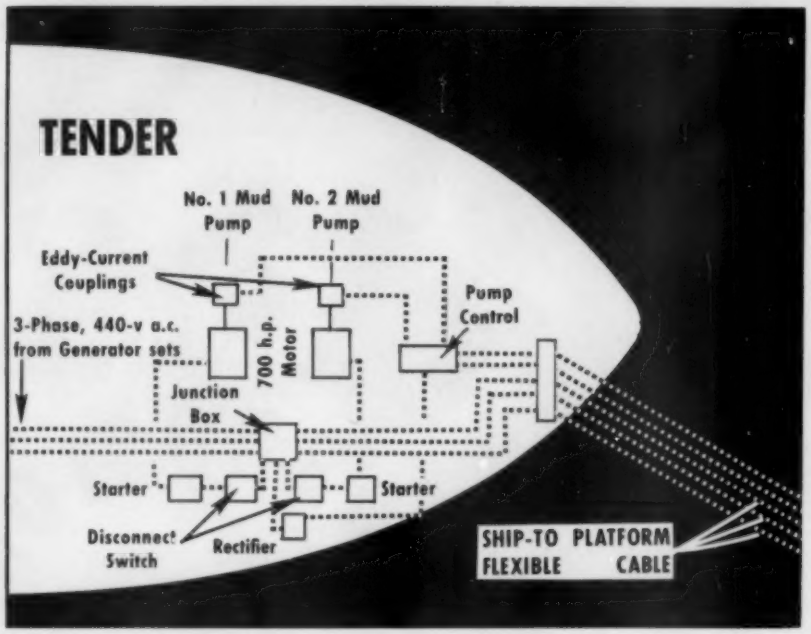
COMPLETELY A.C. is the power the Joseph Zeppa supplies to rig motors. Fig. 1.



THE TENDER carries the diesel-driven generator sets which produce three-phase, 440-volt a.c. electricity. Current is rectified for controls. Fig. 2.

New Tender Features A.C. Power

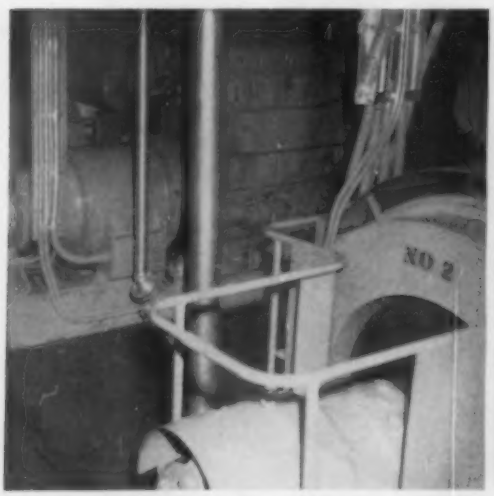
Only one electrical system and one group of engines needed

by Ed McGhee
District Editor

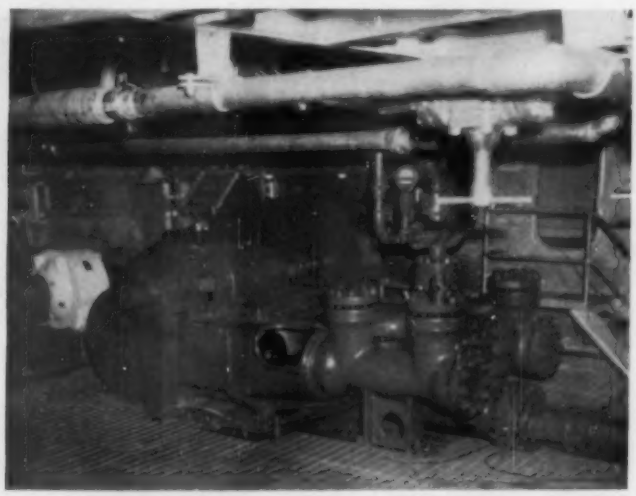
DELTA Marine's new tender, the Joseph Zeppa, carries the only existing rig generating and using a.c. power to run a.c. motors on drilling equipment. Advantages claimed for the a.c. drive are low cost, easy control, cheap maintenance, and flexibility of power distribution. Since the a.c. motors run at constant speed, they drive through eddy-current couplings to get variable torque and speed. Delta Marine's experience with this new approach will bear close watching for its outcome may have an impact on future rig design.

Since electricity was first used on drilling rigs, there have been attempts to use a.c. equipment. It is low in cost, cheap to maintain, and can use purchased power wherever it is economical and available.

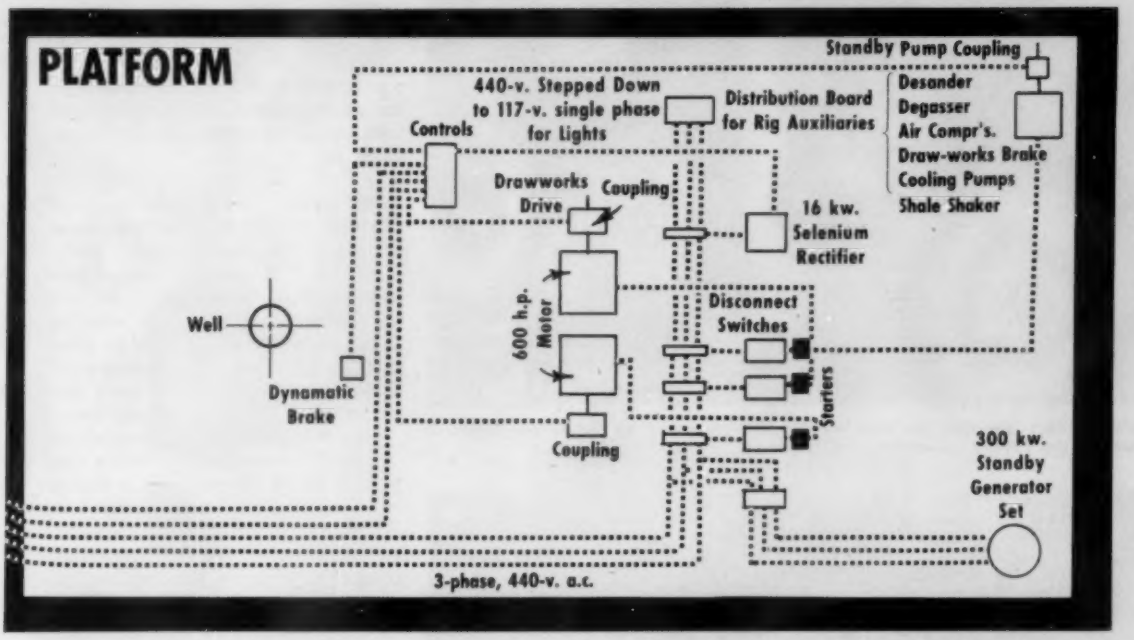
Moreover, a municipal-type a.c.-power system has a lot of freedom and



ENGINES AND GENERATOR on Joseph Zeppa are part of the 1,600-kw. power source. Fig. 3.



MUD PUMP is driven by a.c. motor through eddy-current coupling (white, in left rear). Fig. 4.



THE PLATFORM equipment is all driven by a.c. motors. Eddy-current couplings between motors and loads provide variable speed not available from a.c. motors. A.c. equipment is low in cost, cheap to maintain and can use purchased power. Fig. 2.

flexibility. In such a system, any number and size of generators put all their output into a single bus system. Then, each load takes power from this one common system as needed. No one generator is connected to a particular motor, and there's no need to control the generator field.

Total generating capacity needs be only as great as the power required by whatever rig loads are running at time of peak usage. Usually this capacity is less than if generators and motors are paired, and a.c. motors can easily be made explosionproof.

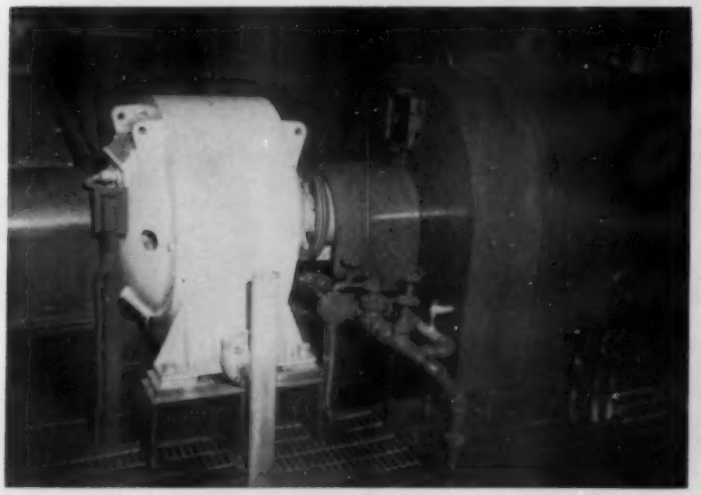
The 110-volt a.c. power for lights and rig auxiliaries can be taken from transformers, so there's no need for installation of a separate light plant.

. . . The difficulty has been in getting variable speed and torque from a.c. motors. Slip-ring motors and like methods are expensive and hard to control. On the other hand, a.c. squirrel-cage motors have no slip rings nor commutators, and they can run with little maintenance. Controlling them is simple. However, the squirrel-cage motor is essentially a constant-speed device; and in the past, there has been no reliable way to connect it to rig loads which require variable speed and torque.

DRILLING

On new tender-type rig . . . Delta Marine Drilling Co. has designed its new tender, the Joseph Zeppa, to take advantage of the benefits of a.c. drive. Delta Marine is getting around the problem of constant speed by using eddy-current couplings between motors and loads. These allow slip from a full 100 per cent with load stalled down to almost no slip with full power being transmitted.

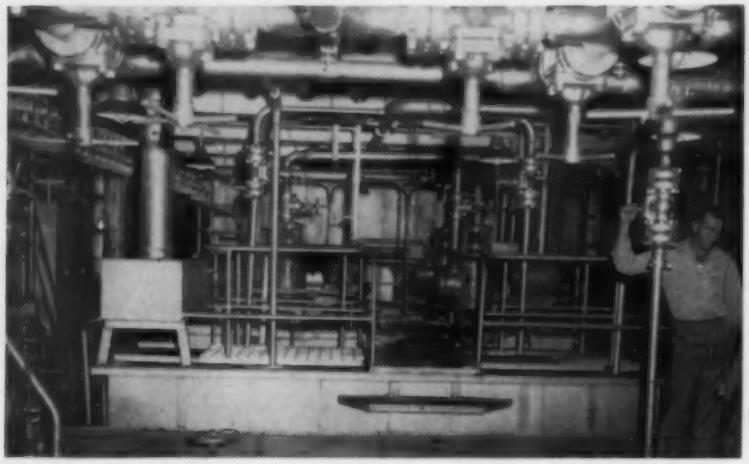
The Elmagco couplings are easily regulated over the entire range of slip and power transmission. Control is a simple matter of varying with a rheostat the small current impressed onto the coupling. Motor control is, of course, built in, and there is no



MUD-PUMP DRIVE is a.c. motor, right, and eddy-current coupling (painted white). Such couplings can take the place of clutches as well as fluid couplings or torque converters. Fig. 5.

CONTROLLER for couplings driving mud pumps is inspected here by I. J. Flowers, drilling superintendent for Delta Marine. Fig. 6.

DRAW WORKS that does the work on the platform served by the Joseph Zeppa is powered by two 700-hp. a.c. motors. Fig. 7.



MUD TANKS on the Joseph Zeppa are equipped with vertical mixers. A small tank on the platform serves in emergencies. Fig. 8.

need to control the generator field.

Because of the slip nature of these couplings, there is no vibration nor torsional shock load imposed on the motor or the driven load. As a result, equipment and motor life should be long and maintenance should be low. Moreover, there is no possibility of chains being broken by motors running away at no-load condition.

Single electrical system . . . Because it is using a.c. throughout, the Joseph Zeppa has only one electrical system and one group of engines. There are two 1,080-hp. engines and one 150-hp. engine; this total of 2,310 hp. drives 1,600-kw. in a.c. generating capacity, all of which goes into the common bus system. Fig. 2 shows this single electrical system.

There is a 450-hp. generator set on the well platform, but this operates only in emergencies — such as when it is necessary to pull the tender away from the platform.

On the drilling equipment, there are five electric motors having a combined total rating of 2,900 hp. Moreover, auxiliaries of the tender and rig have motors with a combined total of more than 600 hp.

With any other type of drive than a.c., Delta Marine figures the tender would have to have more installed horsepower. Besides, with any other type of system, there would have to be a separate a.c.-generating system for auxiliaries and lights. Thus, initial cost and fuel bills would be higher.

Used as engine clutch too . . . The Elmagco couplings used on the Joseph Zeppa have been used elsewhere on rigs driven with internal-combustion engines. Similar couplings are in use on drilling tenders as clutches to connect drilling engines to compound transmissions. In these installations the eddy-current couplings take the place of clutches as well as fluid couplings or torque converters. There is also the possibility of using the couplings with purchased power.

Stepless, adjustable control of the eddy current by means of the exciting field in the coupling gives almost instantaneous control. Each of the devices has its own independent cooling system which can dissipate the heat represented by the full horsepower of the driving motor. The coupling controls torque by slipping at any torque value set.

In the tender . . . Fig. 3 shows one of two GM 12-cylinder, 1,080-hp. diesel engines in the Joseph Zeppa's power plant. Each of the two large engines drives a 750-kw., three-phase, 440-volt a.c. generator. Side by side with the large engines is a GM 150-hp. diesel driving a 100-kw. a.c. generator. Of course, the output of all three generators goes into the common bus.

The Bethlehem G-85 pump shown in Fig. 4 is one of the two main mud pumps. The other pump is a Bethlehem 600. Each of these is driven by a 700-hp., three-phase, a.c. motor, driving through a No. 9 Elmagco coupling. Fig. 5 shows the coupling and motor on one of the pumps. Fig. 6 is the controller that regulates both the mud-pump couplings.

On the platform . . . Fig. 7 shows the draw works that drills on the platform served by the Joseph Zeppa. This Emsco J-1250 draw works contains a conventional transmission. It is powered by two 700-hp. a.c. motors, each driving through a No. 9 coupling. The 27½-in. Ideco rotary is chain driven off the draw works. The foot throttle on the draw works is the same as for a power rig. Instead of throttling engine speed, it regulates the couplings between motors and draw works.

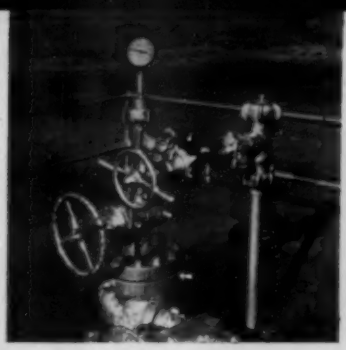
If, during drilling, accident or bad weather makes it necessary for the tender to pull away from the drilling platform, the tender's power is lost to the rig. For that reason, there must be standby facilities on the platform so that the crew can continue to circulate mud and rotate the pipe. Standby a.c. power will be provided by a 450-hp. engine driving a 300-kw. a.c. generator.

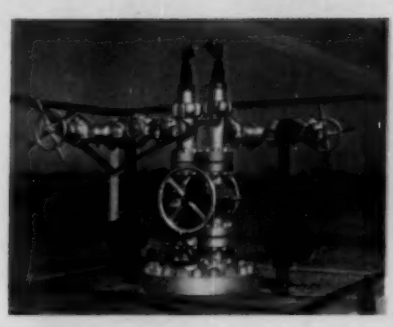
Standby mud circulation will be by a National C-250 pump run by a 300-hp. motor with a No. 8 Elmagco coupling. There is a small mud tank on the platform with the shale shaker. Mud flows into this tank and then to the main tanks on the tender shown in Fig. 8. Thus, if the tender must pull away from the platform, there will be enough mud capacity to continue circulating.

The derrick is a 140-ft. Lee C. Moore Type K.

Acknowledgment

The author wishes to thank George Stetson, chief engineer, and I. J. Flowers, drilling superintendent, Delta Marine Drilling Co., New Orleans, for their help in preparation of this article.





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- Well costs are reduced. Penetration rates are increased and troubles reduced. Drilling crews are relieved from the work and hazard of adding large amounts of barite and massive chemical treatments to the mud.

by Ray W. Williams and John Mesaros

THE greatest value of centrifuging as a mud-engineering tool is based on the problems of maintaining weighted muds. Even when no difficulties are being experienced, the normal maintenance of high-density mud is very costly. Watering back such a mud has been an accepted procedure because the fine formation particles which are not removed by the shale-shaker screen or by settling in the tanks become a part of the mud.

Presence of these fine, lightweight formation particles affects the mud adversely in that they occupy space. The volume of the liquid phase is reduced when these additional solids are present. The character of these solids can be altered by chemical treatment so that more of them can be tolerated before a mud loses its desired properties, but eventually their concentration in the mud must be reduced.

Watering back, therefore, has been necessary to maintain the mud in its normal range of properties. In high-density muds the problem is intensified by the presence of large amounts of barite, which is the most expensive component of the mud.

Authors are with Phillips Petroleum Co., respectively, at Alvin, Tex., and Oklahoma City, Okla. Paper presented under the title, "The Centrifuge and Mud Technology," at the 1956 spring meeting of the Southern District, A.P.I., Division of Production, Shreveport.

Cost of Diluting a Mud

When a certain volume of water is added to the system, room must be made for that water. The preparation of a new mud having a density, for example, of 17.0 lb. per gal. will involve the use of the typical amounts of materials as given in Table 1.

TABLE 1—COST OF PREPARING 1 BBL. OF 17-LB. MUD

Material—	Lb. per bbl.	Cost per lb.	Total cost of material
Bentonite	6	0.02	0.12
Driscose	1½	0.90	1.35
Graphite	2	0.16	0.32
Quebracho	1	0.18	0.18
Caustic	1	0.09	0.09
Weight material	475	0.026	12.35
			$14.41
(Handling and breakage, 10 per cent)			1.44
Total cost			$15.85

Suppose that a 1,000-bbl. mud system needs to be watered back an amount that will require the jetting away of 100 bbl. of mud. The mud, after being diluted, must be conditioned with weighting material and sufficient chemicals to maintain the desired properties. In actual practice, the conditioning takes place at the same time as the addition of the water, and such additives as bentonite may not be used. The cost of getting the total system back to its original 17.0-lb. per gallon weight and the use of the necessary chemical additives will amount to about the same as would the preparation of a new mud.

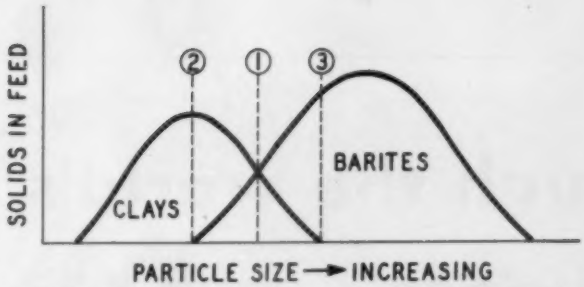
Conditioning the mud system by the watering-back method will, therefore, be equal in cost to the value of 100 bbl. of mud worth $1,585 which was jetted away plus the cost of making 100 bbl. of new 17-lb. mud—another $1,585. The cost of this procedure will be $3,170.

Cost of Centrifuging a Mud

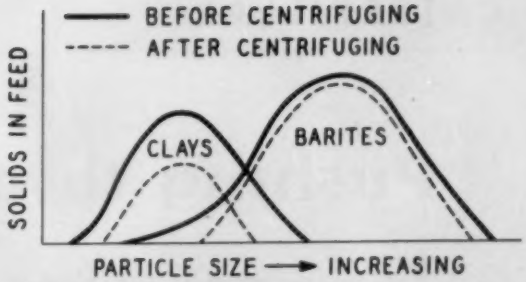
The centrifuge process eliminates the need for watering back a mud because the drilled solids are removed mechanically. The barites are removed and returned to the mud system in the form of a heavy sludge. The sludge must be thoroughly mixed back into the rest of the mud in the tanks. The light solids and water and chemicals are discharged into the reserve pit as effluent.

If 100 bbl. of mud is processed through the centrifuge, all of the chemicals will be lost and a small amount of barite will be rejected along with the clays. Let us assume that the machine is throwing away 15 per cent of the barite which it processes. Because there is $1,235 worth of barite in 100 bbl. of the mud, the centrifuge will recover 85 per cent or $1,050 worth of barite.

The chemicals in 100 bbl. of this 17-lb. mud are also lost in the process. The difference in the cost of the mud and the value of the barite re-



SEPARATION with the centrifuge depends on the particle size and density of the solids. A cut might be made at 1, 2, or 3, depending on mud weight and drilling conditions. Fig. 1.



PARTICLE-SIZE DISTRIBUTION in a centrifuged mud is continually changing. Although clays are discarded from a weighted mud, the size overlap with barites causes some clays to remain. Fig. 2.

covered represents the cost of centrifuging the mud. This cost must be in addition to the $1,585 which was originally spent to prepare the mud. Table 2 shows this cost and the savings over the dilution method.

TABLE 2—COMPARISON OF COST OF CENTRIFUGING 100 BBL. OF 17-LB. MUD WITH DILUTION METHOD

Centrifuging	
Original cost to prepare 100 bbl.	$1,585.00
Cost of barites and chemicals lost in process	535.00
Total cost	$2,120.00
Comparison	
Cost of jetting and watering back	$3,170.00
Cost of centrifuging	2,120.00
Savings by centrifuging	$1,050.00

Watering back is still in common practice, and in some areas the mud is conditioned in this manner as often as three or four times a week. Where the centrifuge is made to perform properly, it is effectively removing solids in such quantity and over such a range of sizes that these larger water dilutions are not necessary; nor are the larger and often complicated chemical treatments of the past needed.

Particle Sizes and Weights

In understanding the centrifugal separation process of a drilling mud, the distribution of the size of particles of various densities must be considered.[1] If a mud contains weighting material having a specific gravity of 4.2 and formation solids having a specific gravity of 2.5, the process would present no problem if all of the particles were the same size and shape. Unfortunately, many of the barium sulfate particles will be smaller than some of the formation particles. The separation process is affected by the size of the particles as well as their specific gravity. Fig. 1 shows the particle-distribution situation that might exist in a drilling mud.

The curves show that it is impossible to separate and discard all of the clay solids and retain all of the barite. Frequently, as much as 15 per cent of the barite present in a mud is less than 10 μ in size.[2] The next best approach, then, is to separate all of the clay possible and retain as much of the barite as possible. The cut necessary to make this type of separation would be at the point where the curves intersect at line (1). Some of the clays would be retained in the sludge and some barite would be rejected with the clay in the effluent.

Centrifuge applications . . . The relationship between mud control and centrifuge process now becomes significant. If the curves shown in Fig. 1 represent a weighted 12-lb. per gal. mud in a fast-drilling hole making a large amount of solids, the mud engineer would decide to make a cut as shown by line (3). Here, he may actually throw some extra barite away in his effort to remove all of the drilled solids. He will consider the economy and the need for a certain set of mud properties under the existing drilling conditions such as depth, drilling rate, and the type of mud he will need when the well gets deeper.

If the curves in Fig. 1 represent a 17-lb. mud being used while the drilling rate is medium, it will be necessary to take a cut at the point where line (2) intersects the curve. This decision would require the engineer to run the centrifuge for longer periods of time until the drilling rate slows down.

The condition of the mud is all important in such decisions. It is necessary to recover all the barite possible when centrifuging a heavily weighted mud, but it is more important to keep the best possible mud properties. The mud man may, therefore, have to slip the separation line back to the right of line (2) even though he will knowingly discard valuable barite.

The fallacy of using Fig. 1 to explain why different separations are necessary is that the distribution curves for particle sizes in a given mud are always changing (Fig. 2). These distributions are dependent on the drilling rate, mud weight, and the amount of time which the centrifuge has already been run.

Guides for Field Use

Practical application of a centrifuge is dependent on the engineer who must use it. He must be the same man who is responsible for the care of the mud. He must know the history of the mud and when he uses the centrifuge, he must know why he is using it. The centrifuge is usually thought of as a means of saving expensive barite, which is true. However, remember that this is done by removing and discarding clay.

Solids content . . . Several means are at the disposal of the engineer for determining the condition of his mud as related to solids content. They are: (1) Stormer viscometer; (2) Fann V-G meter; (3) hand centrifuge; (4) oil retort.

Use of the oil retort is one of the better methods of determining whether the mud is in need of centrifuging or chemical treatment. To use it or any of the other testers properly, the mud engineer must know what the properties will be when the mud is in the best possible shape. Suppose that a funnel viscosity of 50 seconds A.P.I. indicates that the mud is just as he wants it. He will also know that some higher viscosity, perhaps 60 seconds, indicates that the solids content of the mud is approaching a critical concentration above which the viscosity will rise very fast and the mud will be in poor condition. By using the oil retort, he can determine the ideal solids content for that mud.

Case 1 . . . If after several days of drilling, the funnel viscosity is climbing towards 60 seconds, there is a need for a solids-content determination. The solids content of the mud will usually be found to have in-

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Right-of-way is 65 feet. The ditch measures 52 inches at the bottom and 90 inches at the top. This is widened to 8 feet, 4 inches in sandy terrain. Here the No. 583 Pipelayers stay 10 to 12 feet from the 6-foot-deep ditch to lower the 150-pound-per-foot, 34-inch pipe. All pipe is being cradled in immediately following the doping and wrapping operations.

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creased. Table 3 shows some sample retort determinations.

TABLE 3—RETORT METHOD INDICATES MUD NEEDS CENTRIFUGING

Ideal Funnel viscosity, 50 seconds	Volume per cent	Undesirable Funnel viscosity, 60 seconds	Volume per cent
Oil	5	Oil	5
Water	64	Water	61
Solids	31	Solids	34
Total	100	Total	100

This example indicates that the mud needs to be centrifuged. In actual practice, the mud engineer will leave a standing recommendation for the crews to maintain the viscosity between 50 and 60 seconds with the centrifuge. As far as the crew is concerned, only the viscosity is being controlled by the centrifuge. Either the solids content, as determined with the retort, or the funnel viscosity is a useful index to the mud man in keeping the mud right.

Case 2 . . . Now suppose that the mud from Case 1 has increased in viscosity to 70 seconds. The retort method shows that the solids content remains unchanged. This would immediately indicate that the mud has been contaminated and requires chemical treatment rather than centrifuging. See Table 4.

TABLE 4—RETORT METHOD INDICATES MUD IS CONTAMINATED

Ideal Funnel viscosity, 50 seconds	Volume per cent	Undesirable Funnel viscosity, 70 seconds	Volume per cent
Oil	5	Oil	5
Water	64	Water	64
Solids	31	Solids	31
Total	100	Total	100

Advantages of Low-Solids Muds

Advantages of low-solids, low-viscosity systems are well known to drilling engineers.[3] Pumps run better and parts need not be replaced as often. The pump discharges the fluid with less pressure buildup. The drill stem in which most of the pressure drop occurs can handle the same velocities at reduced pressures. More of the hydraulic horsepower can be delivered to the bit nozzles in the form of greater velocities. The cuttings are removed more quickly from beneath the bit teeth and are not reground to finer particles. Velocities in the annulus, too, are greater. This helps keep the hole cleaner and brings the cuttings to the surface faster.

These advantages exist because the light formation particles are not present in the mud. The pump is not required to circulate them through the system. The additional pressure that must be used when the undesirable solids are present is no longer needed and can be used to gain other advantages.

This removal of drilled solids with the centrifuge has affected all phases of mud-engineering problems. New approaches are now being made to such situations as lost circulation, settling of cuttings, penetration rates, fluid velocities, and hole conditions.

Lost-Circulation Example

Use of the centrifuge and a working knowledge of flow properties must go hand in hand. This was shown during a lost-circulation problem on a wildcat well on the Gulf Coast. Table 5 lists pertinent well data.

TABLE 5—CONDITIONS DURING CASE OF LOST CIRCULATION

Well Data	
Depth, ft.	11,925
Hole, in.	8½
Drill pipe, in.	5
Pump stroke, in.	20
Liner size, in.	6
Strokes per minute	43
Gage pressure, psi.	1,250
Mud Data	
Mud weight, lb. per gal.	17.0
Funnel viscosity, seconds	62
Plastic viscosity, cp.	41
Yield point, lb. per 100 ft.[2]	23

As soon as mud loss was recognized the pump was slowed down from 43 to 28 s.p.m. This effected a reduction in the gage pressure from 1,250 psi. to 750 psi., or 500 psi. The annular velocity was likewise reduced from 178 to 117 ft. per minute. The actual effect of slowing down the pump in reducing the pressure of the circulating fluid at the bottom of the hole is found by the pressure-drop equation for laminar flowing fluids:[4]

$$P = \frac{t_y l}{225\ D} + \frac{\eta V l}{1{,}500\ D^2}$$

where:

- P = total pressure drop in psi.
- η = plastic viscosity of mud, cp.
- l = total length, ft.
- V = mean fluid velocity of the mud, ft. per second
- t_y = yield point of the mud, lb. per 100 ft.[2]
- D = bit size minus pipe o.d., in. (annular flow)

Bottom-hole pressure at 43 s.p.m.:

$$P_1 = \frac{11{,}925\ (23)}{225\ (3.5)} + \frac{(41)\ (11{,}925)\ (2.9)}{1{,}500\ (3.5)^2}$$

$$P_1 = 425 \text{ psi.}$$

Bottom-hole pressure at 28 s.p.m.:

$$P_2 = \frac{11{,}925\ (23)}{225\ (3.5)} + \frac{(41)\ (11{,}925)\ (1.95)}{1{,}500\ (3.5)^2}$$

$$P_2 = 400 \text{ psi.}$$

By slowing the mud pump down from 43 to 28 s.p.m. the pressure at the bottom of the annulus was reduced by only 25 psi. Though circulation is frequently regained by this method, the fact still remains that the pressure exerted on a weakened formation had not been greatly altered.

Change flow properties . . . The next approach to the problem was to improve the flow properties of the mud. The centrifuge was used to further reduce the solids in the mud, and a small amount of water and chemicals were added for the purpose of reducing the yield point of the mud. The weight of the mud was not altered from its original 17.0 lb. per gal. After conditioning the mud, the yield point was reduced from 23 to 11 lb. per 100 sq. ft. The funnel viscosity was 50 seconds. The plastic viscosity remained the same.

With these new properties and with a pumping rate of 43 s.p.m. bottom-hole pressure was:

$$P_3 = \frac{11{,}925\ (11)}{225\ (3.5)} + \frac{(41)\ (11{,}925)\ (2.9)}{1{,}500\ (3.5)^2}$$

$$P_3 = 244 \text{ psi.}$$

Lowering the yield value resulted in a reduction of the bottom-hole circulating pressure of 181 psi. This represents a significant improvement in the hydraulic system.

Besides solving one particular lost-circulation problem, here is very definite proof of the effect of high yield points on circulating pressure. Formation solids in the mud cause high yield points.

Reducing the pump pressure, as is the first tendency when mud is lost to the formation, actually gives only limited assistance to the problem at hand. The 500-psi. change in the standpipe gage reading was in the most part

caused by reduced pressure drop inside the drill stem where the mud is in turbulent flow. In turbulent flow a large decrease in pressure accompanies only a small reduction in velocity. The yield point of the mud is by far the most significant factor affecting the pressure drop when the mud is in laminar flow.

The practice of loading up a mud with lost-circulation materials in thief zones is fast losing favor in many areas. The presence of high concentrations of such materials in a mud imparts flowing characteristics to the mud which are more likely to increase than to decrease lost circulation. The materials that stop loss of mud can also be the cause of lost circulation. The best approach to this problem is based on having the mud in such condition that pressures due to circulating the mud will be minimized.

Chemical Savings

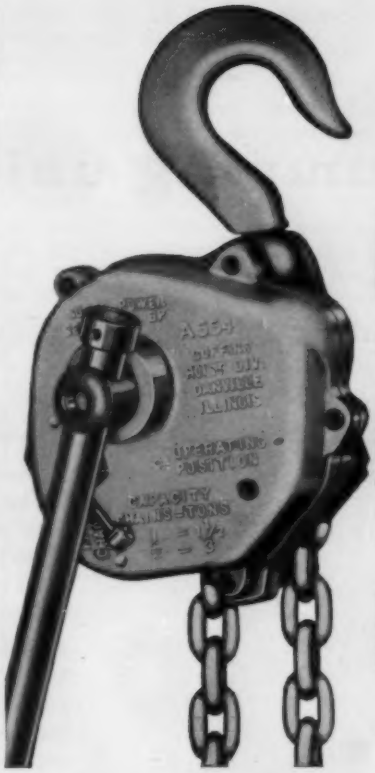
The centrifuge is the best means by which the yield point of a mud can be kept to a minimum value. Large chemical additions or large dilutions with water are also effective but their expense makes them objectionable.

If the clay solids are not present in the mud, then the need for thinning chemicals or water is diminished. This has been proved in actual practice. With a centrifuge at work on the mud, fewer chemical additives are required by the mud to keep it conditioned. A centrifuged mud, however, will require slightly larger amounts of water-loss control and suspending agents such as Driscose. Some of the light solids which give the average mud its suspending and low-water-loss characteristics are removed by the centrifuge and must be replaced.

Contamination

The centrifuge process allows fresh water to replace the salt-laden water in a contaminated mud so that the contaminant is removed. Considerable experience has been gained in treating out the cement from weighted completion and packer muds. A high-pH lime mud can be converted to a low-pH conventional mud with the centrifuge.

In a well near Bay City, Tex., a high-pH lime mud was used to drill through 2,000 ft. of heaving Anahuac shale. During this time cuttings did not appear on the shale-shaker screen. Instead, soft mud balls were present in the mud indicating the type of problem the formation was presenting. From 1,500 to 2,000 lb. of lime was required each tour to keep the solids in the system converted to a calcium



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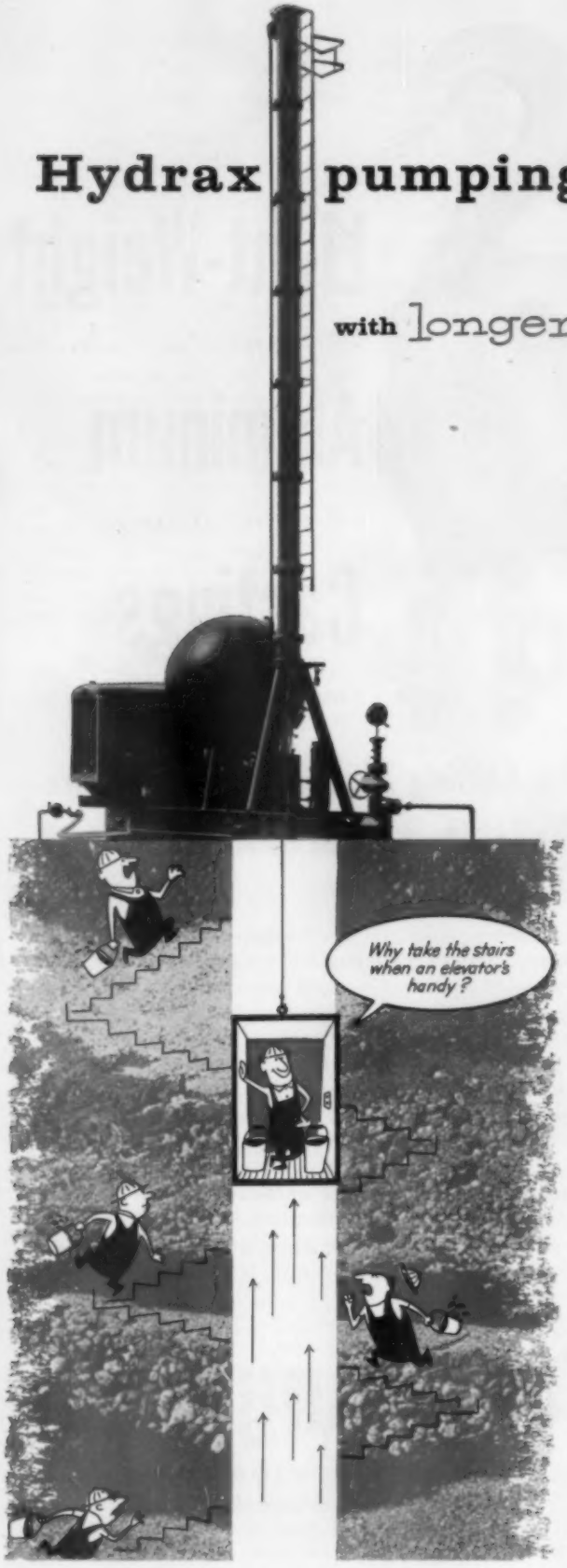

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base. On drilling out of the shale at 7,400 ft. a protection string was set and there was no longer a need for a lime-base mud. At this time the lime content of the mud was 8 lb. per bbl.

The centrifuge continuously processed the mud and in 10 days the lime content was reduced to just a trace. The pH of the mud was maintained at 11.5 to 12.0 to preserve the starch which was still present in the mud. Later the pH was allowed to come down to a value of 9.5. This centrifuged mud was eventually used as a very fine completion fluid. Not a drop of mud had to be jetted away while drilling from a depth of 7,000 ft. to total depth, which was 14,500 ft.

Such low-solids centrifuged muds make very successful packer muds. High-temperature gelation is not a problem with such a fluid.

Mud Salvage

Phillips Petroleum Co.'s centrifuges are made to run about 75 per cent of the time that drilling is in progress. When the centrifuge is not used on the circulating system in the well, it is frequently used to process mud that has been stored in a "duck's nest" or small separated section of the reserve pit. This mud may be processed into a good high-density packer mud which is stored in tanks for future use or the barite recovered may be used for weighting-up purposes at a drilling well.

At one time it was the practice to locate discarded weighted muds in nearby areas and deliver them to a central location in Chocolate Bayou field. The centrifuge would then retrieve the barite from the muds for use in weighting up or preparing other muds. The total cost involved in this method was usually $1.00 or $1.50 per barrel for hauling the mud. Muds weighing 12 lb. per gal. and up were processed in this manner and ultimately saved the company considerable sums of money.

Conclusion

To the mud engineer who works with weighted muds, the centrifuge has become a tool with which he can make and maintain better muds than ever before. He can control the funnel viscosity as well as other properties with the machine. To the operating companies the centrifuge has proved to be a means by which significant reductions in well costs are effected by barite savings. Drilling engineers see the centrifuge as a means to better penetration rates and fewer hole problems. Drilling crews like the centrifuge because it is automatic and foolproof. As the centrifuge runs, the crews are aware that the machine is saving them the work that would be required to add new materials to the mud.

References

1. Bobo, Roy A., and Hoch, R. S.: "The Mechanical Treatment of Weighted Drilling Muds," A.I.M.E. paper No. 290-G.
2. Bobo, Roy A.: Personal communication, June 1956.
3. Wheless, N. H., and Howe, Jack L.: "Low-Solids Muds Improve Rate of Drilling, Cut Hole Time," Drilling, 70, August (1953).
4. Clark, E. H., Jr.: "Bottom-Hole Pressure Surges While Running Pipe," A.S.M.E. paper No. 54-Pet 22.

Pioneer Centrifuging

Rental — Sales

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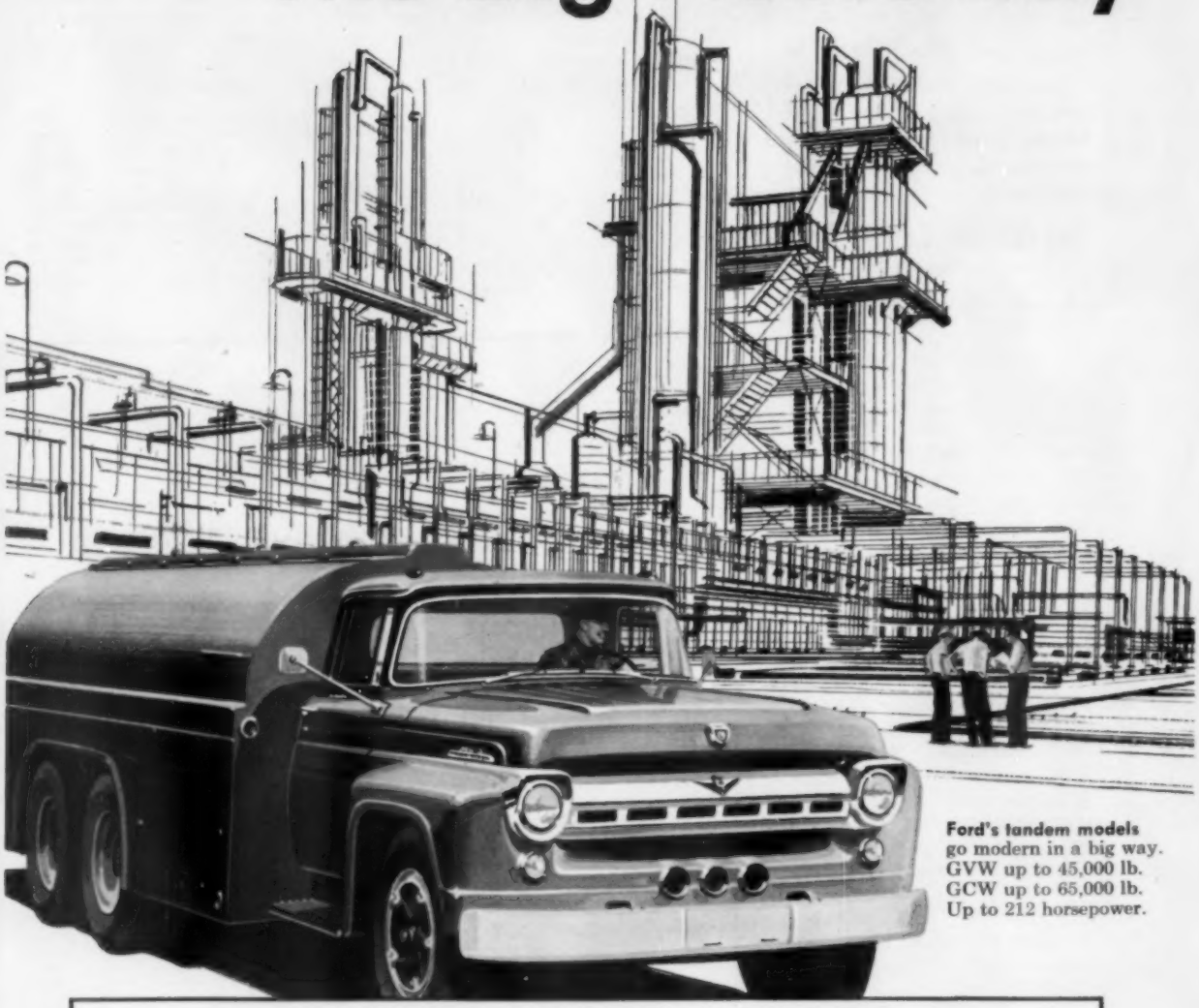

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ELEMENTS OF FIELD PROCESSING—33

Natural-Gas P-V-T Relationships

by Dr. John M. Campbell

A METHOD of predicting the pressure-volume-temperature (P-V-T) relationships of natural gas is essential in all phases of field processing.

The basic relationship is one derived from the Boyles and Charles law for an ideal gas.

$$PV \text{ is proportional to } nT \quad (1)$$

or

$$PV = nRT \quad (2)$$

The value R is a proportionality constant that has become known as a "gas constant," through usage, values of which are available throughout the literature.

The concept of an ideal gas is a convenient one but involves the assumption that the gas molecules have neither volume nor mutual attraction. Consequently, at elevated pressures (particularly above 50 psi.), it is necessary to have other relationships, known as equations of state. Several of these equations of state, including the Beattie-Bridgman, Keyes, etc., have a number of arbitrary constants that make their use tedious and limit their application to specialized uses.

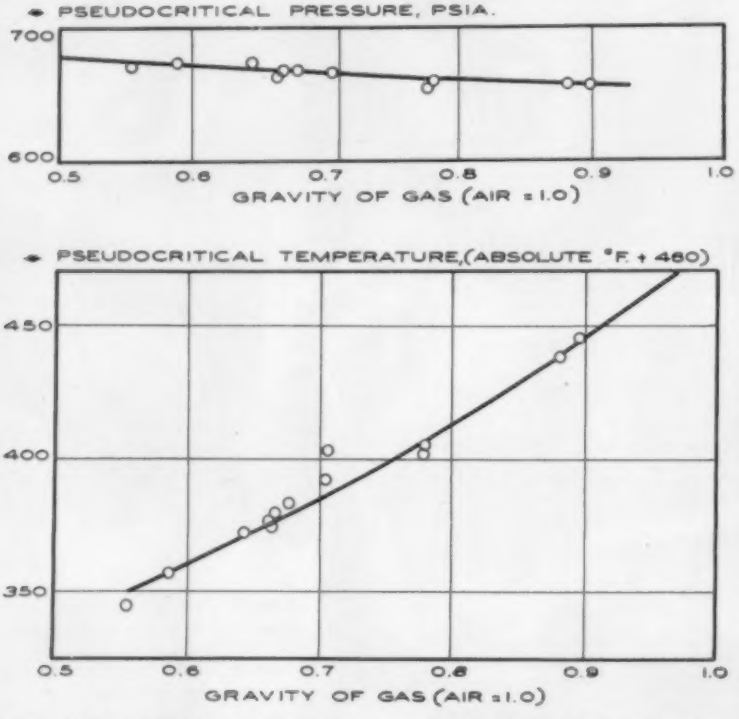
Author is chairman, School of Petroleum Engineering, University of Oklahoma, Norman.

NOMENCLATURE

Term	Meaning	Usual Units
P	= absolute pressure	lb./ft.² abs. or psia.
P_c	= absolute critical pressure	lb./ft.² abs. or psia.
P_r	= reduced pressure, P/P_c	dimensionless
T	= absolute temperature	°R. or °K.
T_c	= absolute critical temperature	°R. or °K.
T_r	= reduced temperature, T/T_c	dimensionless
V	= volume or specific volume	cu. ft. or cu. ft./lb.
V_c	= critical volume	cu. ft. or cu. ft./lb.
V_r	= reduced volume, V/V_r	dimensionless
n	= moles of gas present	lb./mole
R	= gas constant	1,544 (ft.-lb.)/(lb.-mole-°R.) or 10.78 (ft.³-lb.)/(in.²-lb.-mole-°R.)
a	= van der Waals' constant	units used for P, V, and T
b	= van der Waals' constant	units used for P, V, and T
Z	= compressibility factor	dimensionless

NOTE: All equations used are dimensionally homogeneous, so that consistent units must be used throughout.

PRODUCING



CRITICAL PRESSURES and temperatures for a gas can be estimated by the above curves based on gas gravity. Fig. 1.

...The van der Waals equation is the first proposed that has received widespread usage.

$$(P + n^2a^2/V^2)(V - nb) = nRT \quad (3)$$

The values a and b are arbitrary constants.

The principal use of this equation comes from its ability to qualitatively predict the nature of the deviation of real from ideal gases, for quantitatively it does not yield results of satisfactory accuracy. In effect, this equation of state serves as the basis for the concept of compressibility, which is expressed through the factor Z. This factor is incorporated into Equation 2 to give

$$PV = Z\,nRT \quad (4)$$

where Z is the compressibility, or super compressibility, factor. If the left side of Equation 3 is expanded, for n = 1, and transposed, the compressibility factor for a van der Waals gas is

$$Z = 1 + (1/RT) \times [bP + (ab/V^2) - (a/V)] \quad (5)$$

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TABLE 1—CALCULATION OF PSEUDOCRITICAL TEMPERATURE AND PRESSURE

Component—	Mole Fr., N	P_c	T_c	NP_c	NT_c
Methane	0.82	673	344	551	282
Ethane	0.10	708	549	71	55
Propane	0.05	617	666	32	33
Isobutane	0.01	530	766	5	8
n-Butane	0.02	551	732	11	15
	1.00			$P_c = 670$	$T_c = 393$

TABLE 2—SUMMARY OF PROPERTIES OF VARIOUS COMMON GASES

Gas—	T_c-°R.	P_c-psia.	Sp. gr. (air=1.0)	Mol. wt.
Methane	344	673	0.55	16
Ethane	549	708	1.04	30
Propane	666	617	1.52	44
i-Butane	766	530	2.01	58
n-Butane	732	551	2.01	58
i-Pentane	846	482	2.49	72
n-Pentane	829	485	2.49	72
Hexane	914	434	2.98	86
Heptane	972	397	3.46	100
Octane	1,024	361	3.94	114

The quantity in brackets has a value of zero when a and b equal zero, which makes $Z = 1$, a criterion of an ideal gas. Consequently, the constants a and b are a measure of the deviation of an actual gas from the ideal state, where a corrects for molecular forces and b for the molecular volume.

If the pressure is isothermally increased on an actual gas, Equation 5 furnishes a means of predicting the expected variation of Z. At low pressures molecular force, rather than volume, is controlling and the reduction in gas volume is greater than that due to external pressure alone. However, at high pressure the fraction of the total volume occupied by the molecules becomes high, making the first two terms in the bracketed portion the controlling factors. Consequently, a curve of Z versus pressure at constant temperature should initially decrease, reach a minimum, and then increase.

The value of a and b may be related to the critical constants, i.e., pressure, temperature, and volume. Any gas may be liquefied by an increase in pressure provided that the temperature is at or below a value known as the absolute critical temperature T_c. The pressure needed for liquefaction at T_c is the critical pressure P_c, the volume being V_c. Each of the values T_c, P_c, and V_c are fixed characteristics of a pure, single component gas such as methane. Values of these and other constants are shown in Table 1.

The equations for a and b are

$$b = V_c/3 = RT_c/8P_c;$$
$$a = P_cV_c^2 = (27/64)\,R^2T_c^2/P_c \quad (6)$$

which are obtained by writing the van der Waals equation at critical conditions, extracting the three roots, and expanding the terms using the binomial theorem.

Law of Corresponding States

If the values of P, V, and T in van der Waals' equation are expressed as fractions of the corresponding critical states

$$P_r = P/P_c,\ V_r = V/V_c$$
$$\text{and } T_r = T/T_c \quad (7)$$

Further, if a and b are expressed in terms of the critical constants an equation

$$(P_r + 3/V_r)\,(3V_r - 1) = 8T_r \quad (n=1)\ (8)$$

results which is known as the reduced equation of state. It can be seen that Equation 8 contains no terms that are characteristic of a given substance. Therefore, it should apply to all substances and leads to the definition of what is known as the Law of Corresponding States.

This law states that any two or more substances at the same reduced pressure P_r and reduced temperature T_r are in the same state and a universal equation could be written for all substances in both the liquid and vapor states using these coordinates. This concept is not entirely rigorous but yields results sufficiently accurate for most routine engineering calculations.

Pseudocritical Conditions

Inasmuch as most gases are mixtures it becomes necessary to determine the critical constant of the mixture. This may be done experimentally, but the procedure is tedious, costly, and subject to error. Thus, it is customary to calculate pseudocritical constants which are suitable for use in most engineering calculations.

The appropriate pseudocritical constant is obtained by multiplying the corresponding critical value of a pure component by the mole fraction of that component in the mixture, as shown in Table 1.

The value of the critical constants determined in this manner are only approximate but have sufficient accuracy for most engineering calculations. The same scheme may also be used for calculating average molecular weight, specific gravity, etc.

Fig. 1 is commonly used correlation for finding critical pressure and temperature developed by Matthews, Roland, and Katz[1] from representative data. It is reasonably accurate for all applications, in the absence of a gas composition, where the specific gravity is known.

Reference

1. Matthews, Roland, and Katz, Refiner, 21, No. 6, 58 (1942), and N.G.S.M.A. Handbook, 1951.

Next Installment . . .

Will present compressibility-factor charts for use with common gases, including those present in natural gases. Part 34 will be published in an early issue.

Nelson Refinery Construction Index

Appears in the Engineering Section in the first issue each month.
Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.
The Index was explained October 1, 1956, (page 110) as well as the Indexes of Individual Items of Equipment that appear on the Cost-imating page in the first issues of the months of January, April, July, and October.

Index (1946) = 100)

	1949	1952	1954	1955	1956	Jan. 1957
Pumps, compressors, etc.	135.9	155.6	166.5	172.2	192.0	202.6
Electrical machinery	130.9	152.4	160.0	162.5	175.0	185.0
Internal-combustion engines	124.8	146.5	150.5	153.2	164.0	171.7
Instruments	123.1	146.2	154.6	162.9	182.1	186.2
Heat exchangers	133.0	165.8	171.7	156.8	190.7	197.8
Miscellaneous equipment average	*121.6	153.3	160.7	161.5	180.5	188.7
Materials component	143.6	164.3	174.6	176.1	190.4	199.0
Labor component	137.1	163.1	183.3	189.6	198.2	203.1
Nelson construction index	139.7	163.6	179.8	184.2	195.3	201.5

*Used in computing the Nelson Index until April 1952. This is slightly different from the average of the Miscellaneous Equipment Items shown above.

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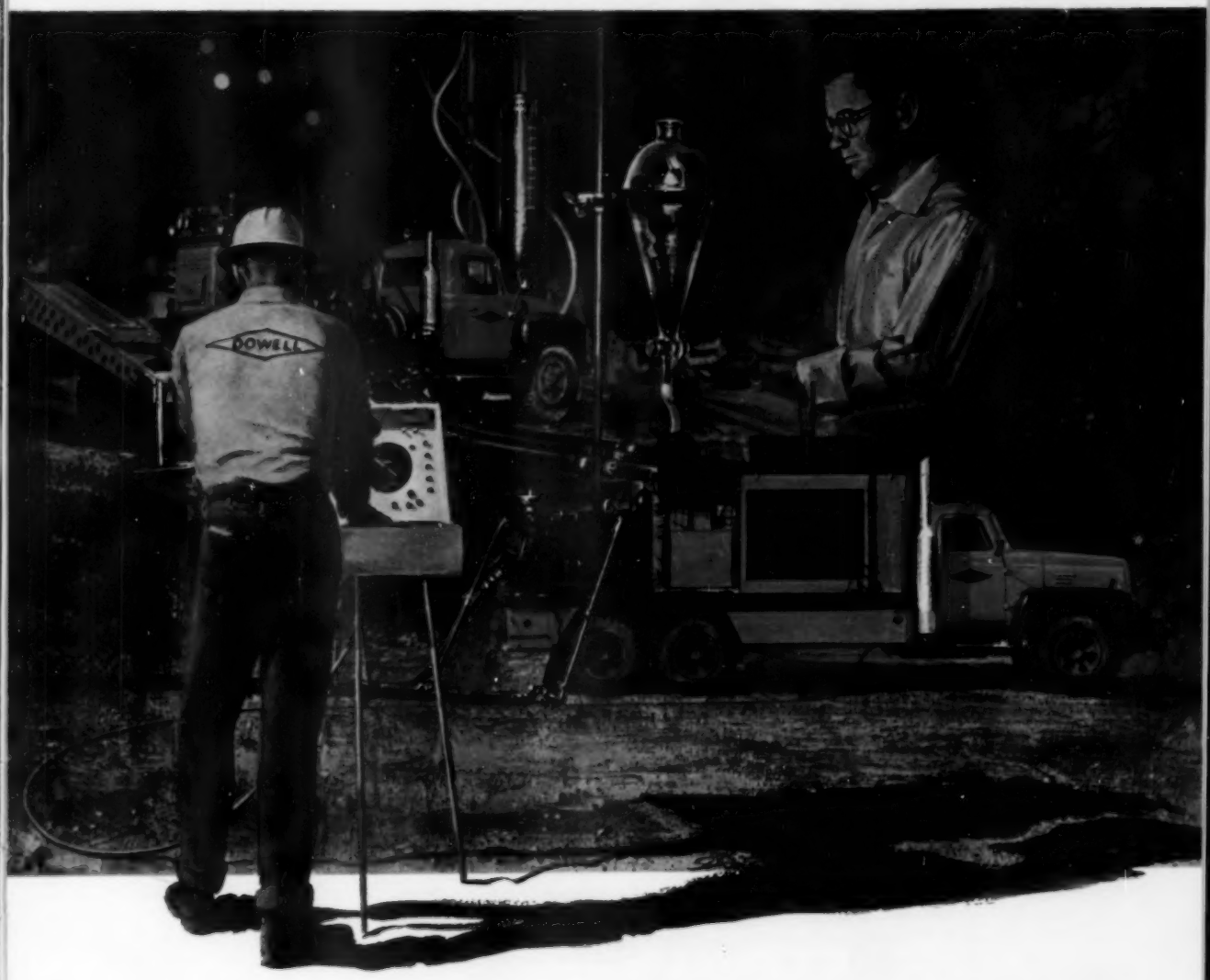

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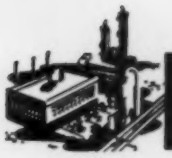
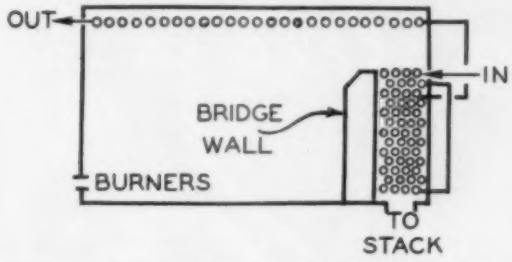
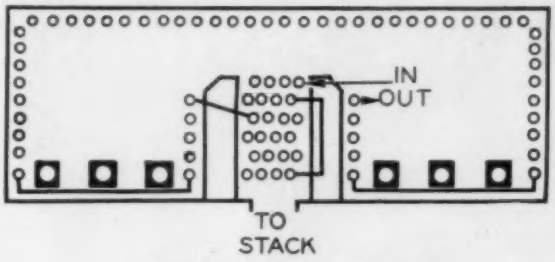


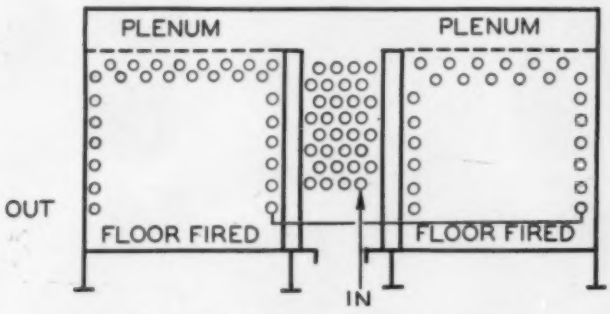
JOB IMPROVEMENT FOR THE PROCESS FOREMAN—88



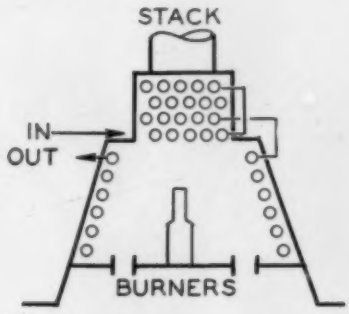
THIS heater is still made for moderate heat loads. Fig. 13-A.



A LATER TYPE of heater. Fig. 13-B.



THIS HEATER has a convection plenum. Fig. 13-C.



A-FRAME heater. Fig. 13-D.

Tube-Still Heaters Have Been Modified

THE early refinery furnaces were all of the shell still type. A relatively large container of oil was heated by building a fire under it.

In a modification of this type of furnace, tubes were placed inside of the vessel of oil and the hot products of combustion passed through these tubes, patterned after HRT boilers.

The tubular type of fired heater, or tube-still heater as it is called, was developed to meet the need for a safer, more efficient, and more flexible furnace. In this furnace the oil or other fluid to be heated is pumped through the tubes and the fire or flue gas is around the tubes.

The first tube-still heaters were constructed similar to a shell still in that a fire was built more or less directly underneath a group or bank of tubes. Experience, however, soon showed that the lowest row of tubes were subjected to too much heat since they received the full radiant heat of the fire and were swept by the hottest flue gases. This type is now used only for small, low-heat-transfer furnaces.

Design modified . . . The design of the tube still heaters was gradually modified until many of them resembled the heater shown in Fig. 13-A. This type of heater had the fault of a low percentage of radiant heat duty (about 40 per cent) as compared with the convection duty (about 30 per cent),

A later type of heater is shown in Figs. 13-B and 13-C. The difference between the two being that Fig. 13-C has a convection plenum above the roof tubes. This type is characterized by having two radiant sections and one convection section. The precentage of radiant heat absorbed is normally 55-65 per cent of the heat released in the furnace.

A-frame heater . . . The highest ratios of radiant duty to absorption duty are attained in the vertical-tubed and the updraft types of heaters. Fig. 13-D, which is a Kellogg A-frame heater, illustrates this type. It is a relatively cheap heater to construct and where high heat-transfer rates can be tolerated it is possible to absorb as much as 70 per cent of the heat released in the radiant section.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.

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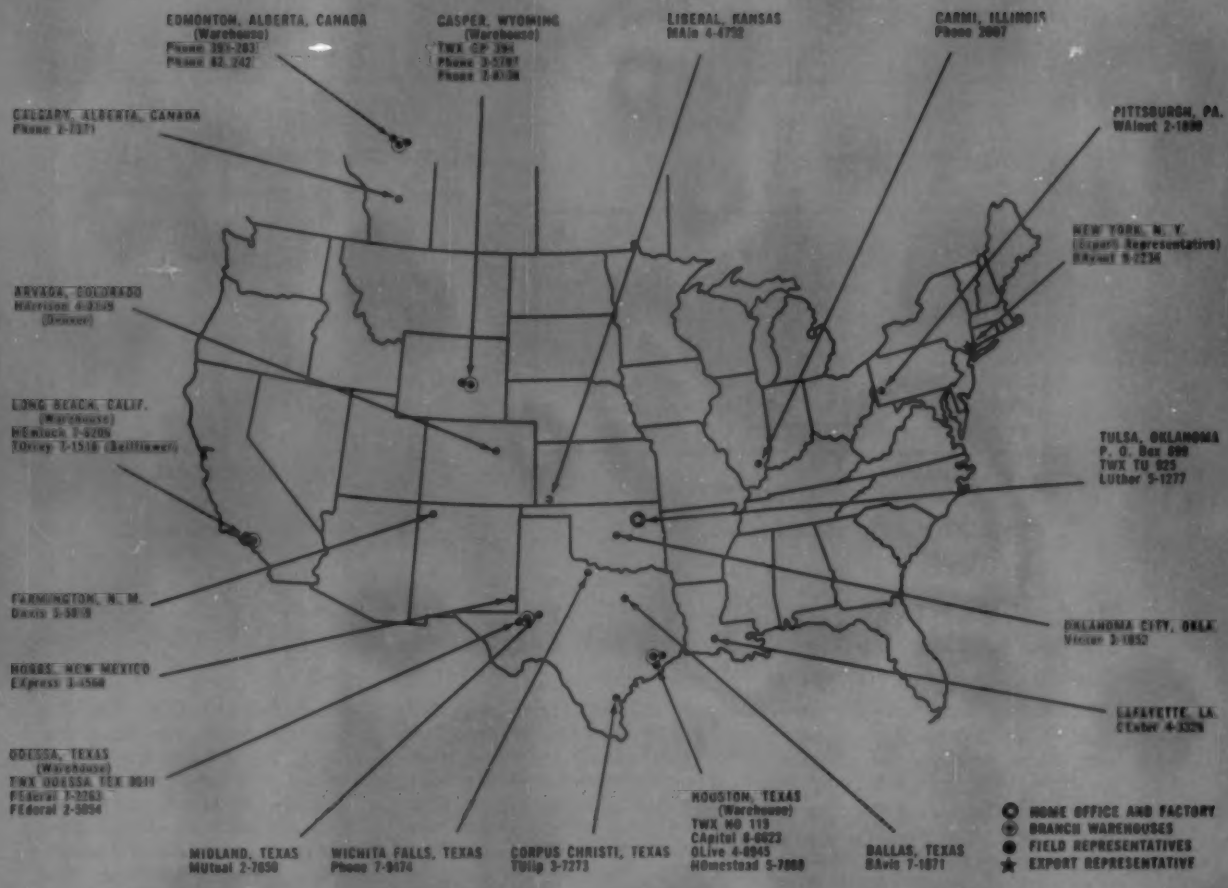

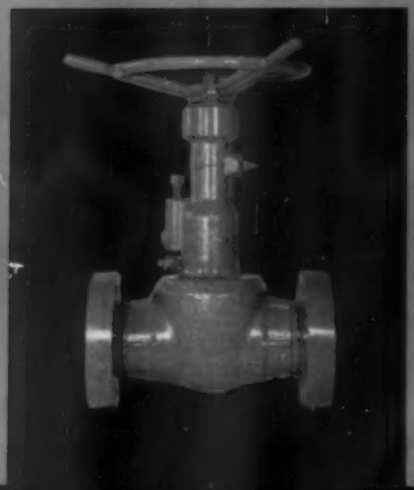

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by Robert L. McIntire
The Datics Corp.

Using Electronic Computers in the Oil Industry **Part 9**

Fractionator Theoretical Tray Calculation

IN the last issue of this series (Part 8, April 15, page 136), the complete set of equations required for solving a theoretical equilibrium step on a fractionator was described. If these indicated calculations were performed without modifications, a tremendous amount of time would be required even with electronic computers. The block diagram shown here sets forth schematically the method used to economize on machine time. Convergence is simultaneously assured.

With a single exception, the nomenclature used in the block diagram was defined in Part 8. This exception, t, is the specified tolerance. The computer is required to continue the iterations from Block 3 to Block 14 until the error functions, ψ_1 and ψ_2, are **less** than this tolerance.

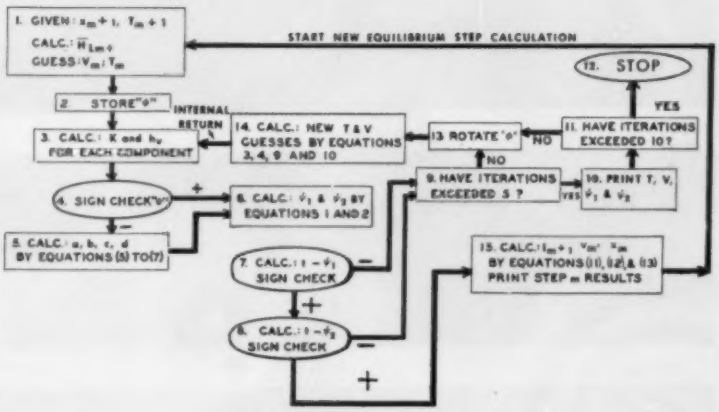
Blocks 9 to 12 are provided to prevent the machine from performing needless iterations. When six or more iterations are needed, the machine signals trouble by printing a limited "monitor." If the iterations exceed 10, the machine stops.

The a, b, c, and d numbers obtained in Block 5 are estimates of the rate-of-change of the error functions. The error functions themselves are computed in Block 6. The major portion of the calculating time is consumed in these two blocks. Unfortunately, the evaluation of the slopes of these error curves takes as much time as the evaluation of the curves themselves.

Reason prevails, however. The slopes of the curves will not change rapidly as T and V assumptions are improved. Further, since the tolerances are enforced on the error functions themselves, we are not required to evaluate the slopes accurately every iteration. All we need is a close approximation of the way in which these functions change with changes in T and V.

The chemical engineer recognizes this latter phenomenon when he "horseback" guesses on T and V gradients. The computer controls the number of horseback guesses with the 11-digit word "ϕ." The word ϕ is composed of zeros and ones. Initially ϕ might be entered in Block 2 as 10010010010. In Block 4, the sign of ϕ is checked. Since the left-most digit is unity, the computer considers ϕ to be negative. The slopes are calculated and stored in Block 5. In Block 13, ϕ is rotated in storage so that the left-most digit is placed to the extreme right of the word. All other digits are shifted left one position. The word becomes 00100100101. On the second iteration, Block 4 shows ϕ to be positive and the computer skips Block 5. The last estimates for the slopes are then used to modify the T and V estimates.

Continued trials with this value ϕ will require new slope calculations approximately every third time. Obviously, ϕ can be modified to alter this safety factor.



BLOCK DIAGRAM

Nomenclature Table

- δ = moles of component as vapor minus moles of component as liquid in passing streams
- Δ = total moles of vapor minus total moles of liquid
- h = molal component enthalpy
- H = average molal enthalpy of a stream
- K = y/x equals vaporization equilibrium ratio
- l = moles of component in liquid
- L = total moles of liquid
- v = moles of component in vapor
- V = total moles of vapor
- ΔQ = enthalpy of vapor minus enthalpy of liquid in passing streams
- T = temperature
- x = mole fraction of component in liquid
- y = mole fraction of component in vapor

PETROdatics

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Part 4—February 18, page 175
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Part 6—March 18, page 153
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Part 8—April 15, page 136

NOTE: Part 10 is tentatively scheduled for May 13 and will contain information on mass-spectrometer analyses.

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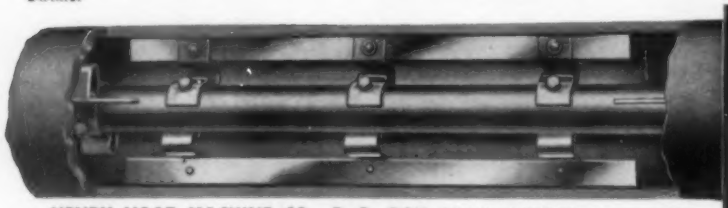

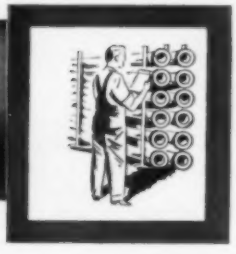

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29. Over-All Plant Costs—Sulfur, Ammonia, Etc.

(Approximate)

by W. L. Nelson
Technical Editor

OVER-ALL PLANT COSTS—SULFUR, AMMONIA, ETC.
(Approximate)

Nelson Refinery Construction Cost Index*

	Material	Labor	M & L
1945	100	100	100.0
1947	122	113	117.0
1948	139	128	132.5
1949	144	137	139.7
1950	149	144	146.2
1951	164	152	157.2
1952	164	163	163.6
1953	172	174	173.5
1954	175	183	179.8
1955	176	190	184.2
1956	190	198	195.3

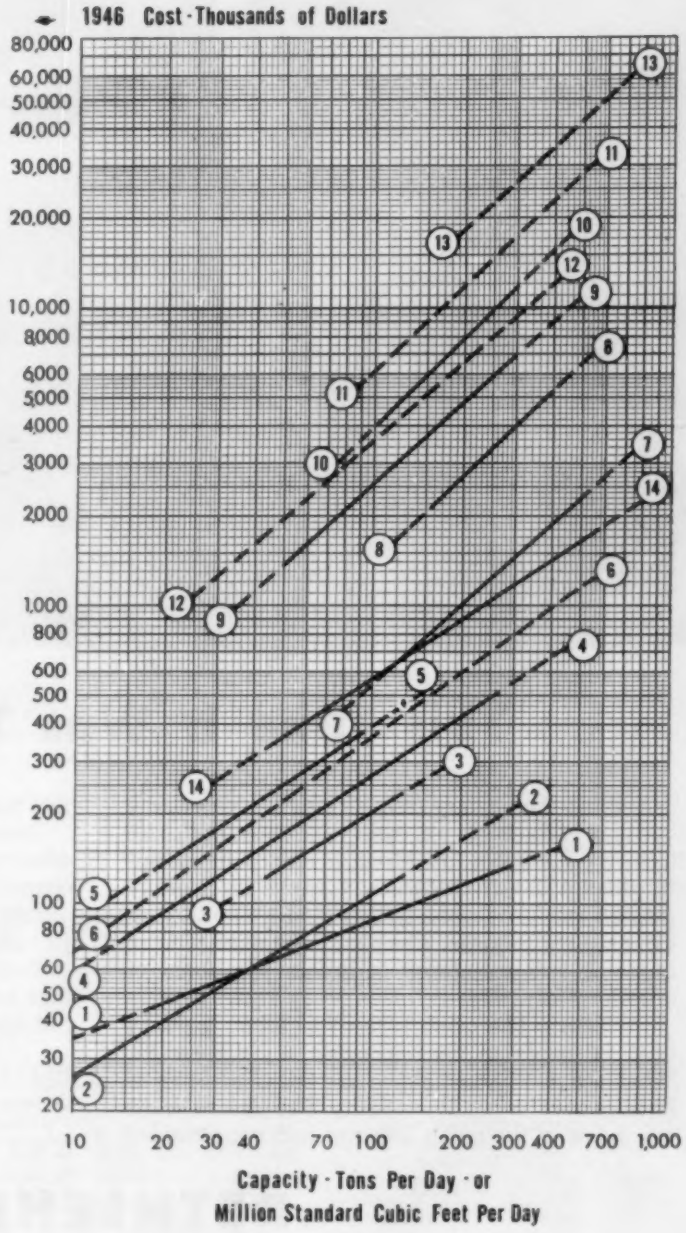
*Oil and Gas Journal, July 7, 1952, p. 105. The Index also appears in the first issue each month and in addition, indexes for many items of equipment are published in the first issues of the months of January, April, July, and October.

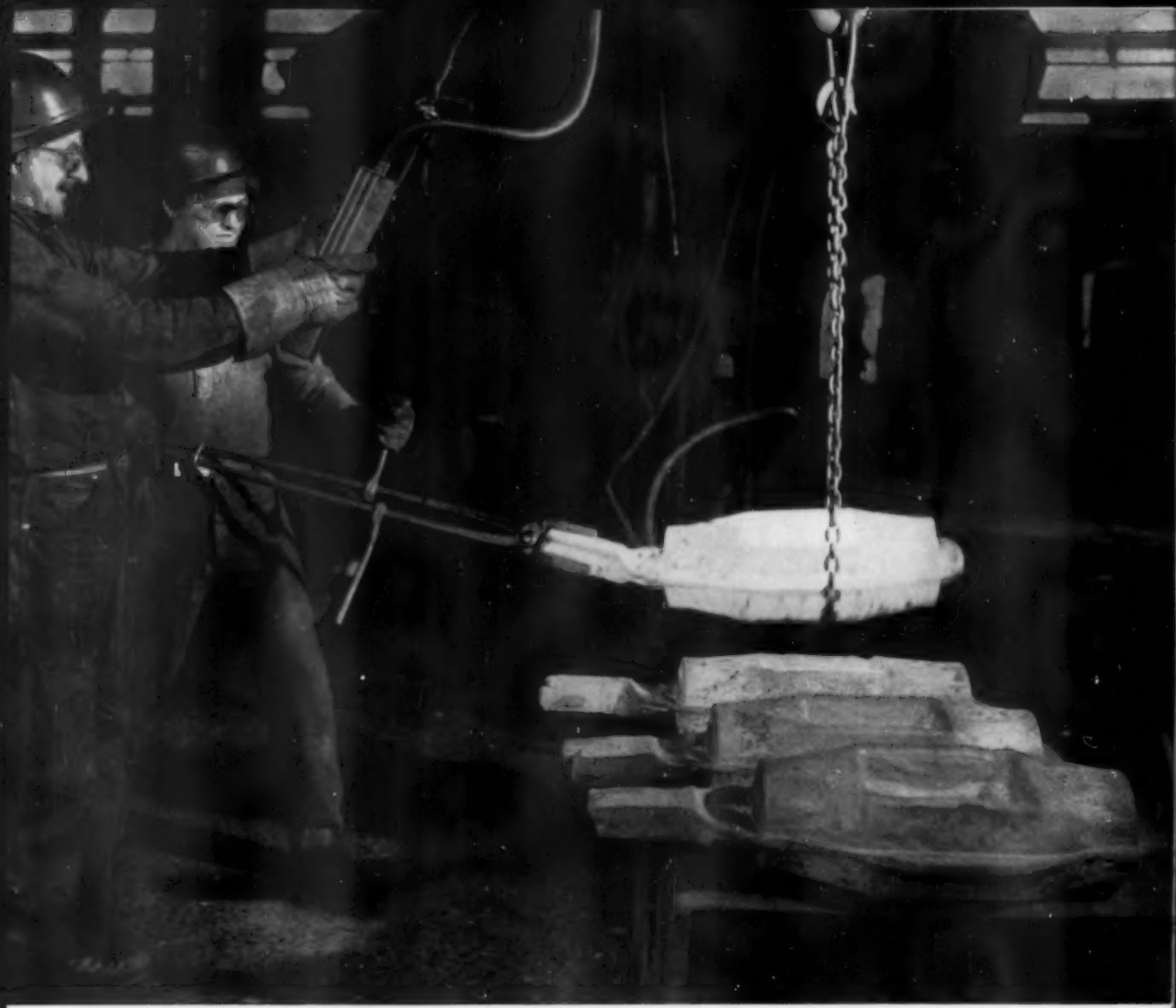
TYPES OF OPERATION, BASIS, AND NUMBER OF PLANTS AND REFERENCES

Curve

1 Desulfurization of gases (M.M.s.c.f.d.—Many references)
2 Dehydration of gases (field practice) (M.M.s.c.f.d.—Over 33 references)
3 *Sulfur from H_2S—70 per cent H_2S and 1 per cent H.C. (Tons per day—Over 25 plants)
4 *Sulfur from H_2S—50 per cent H_2S (Tons per day—Over 25 plants)
5 *Sulfur from H_2S—16 per cent H_2S and 14 per cent H.C. (Tons per day—Over 25 plants)
6 Sulfuric acid, chamber or contact (Tons per day—Over 20 references)
7 Sulfuric acid, alkylation acid (Tons per day—Over 6 references)
8 Nitric acid or urea from ammonia (Tons per day—Over 4 references)
9 Ammonia, anhydrous (Tons per day—Over 70 plants)
10 Ammonia, including HNO_3 or urea (Tons per day—Over 70 plants)
11 Ammonia, including additional products (Tons per day—Over 70 plants)
12 Ethylene (Tons per day—Over 10 references)
13 Ammonia, most complete installations (Tons per day—Over 10 references)
14 Oxygen (Tons per day—Over 35 plants)

*Patterned after Hayes and Barber, The Oil and Gas Journal, April 26, 1954, page 218.





This Time It Was Turnbuckles

One thing that makes drop forging an interesting business is the immense variety of items that come from the hammers. On Monday it may be steam-trap bodies, hand wrenches, and cranks. On Tuesday perhaps spring hangers, parts for oil-well bits, gear blanks, strut forgings. The rest of the week, almost anything you can think of within the limits of drop-forge capacity.

Bethlehem has manufactured so many types of drop forgings that it's impossible to list them all. When the photograph above was taken, some turnbuckles were having their inning. The picture shows you a few of the rough forgings just after leaving the hammer. Each weighed better than 200 lb.

These were relatively large pieces, but Bethlehem often makes drop forgings that run heavier—and of course, many that are smaller. Our range is from approximately one lb to 250 lb; our range of designs, just about limitless.

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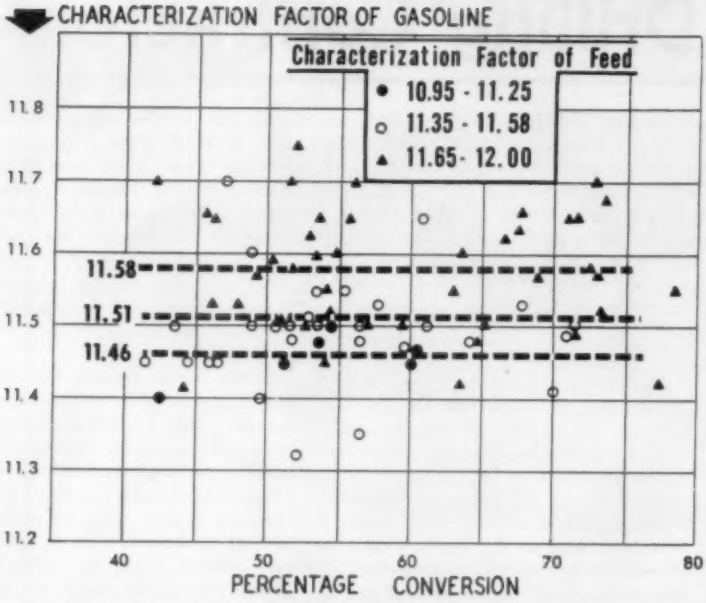

Fig. 1—Effect of percentage conversion and characterization factor of feed stock on the characterization factor of cracked debutanized gasoline. (Only three erratic samples not plotted.)

Characterization Factor of Catalytic Gasoline

by W. L. Nelson
Technical Editor

What is the effect of kind of charge stock on the properties of catalytically cracked gasoline? S.P.G.

Kind of charge stock, that is, characterization factor of charge stock, has a surprisingly small effect, if any, on the characterization factor of catalytically cracked gasoline. This means that substantially the same types of hydrocarbons are produced as gasoline product, regardless of the base or kind of parent feed stock.

This question was investigated by Pedro Fernandez, a graduate student at University of Tulsa, as a special problem or study. He examined data on more than 130 samples reported in the literature listed below, and he found that neither percentage conversion during cracking nor "base" of the original charge stock had a vital effect on the characterization factor of debutanized full (or normal) boiling-range cracked gasoline. This is illustrated in Fig. 1 which shows some of the data. In general, the relationship between characterization factor of debutanized gasoline is somewhat as follows:

Characterization factor		A.P.I. gravity of a 240° F. mid B.P. gasoline
Feed	Gasoline	
11.0	11.44	52.5
11.2	11.47	...
11.4	11.50	53.5
11.6	11.54	54.5
11.8	11.57	...
12.0	11.61	55.5

Not enough samples were available for an estimate of the properties of 300°-400° F. naphthas. However, the characterization factor of naphthas are lower, being in the range of 10.55-11.0 (for the samples available) and at higher conversions the factors of the naphtha are low.

An attempt to relate octane number to conversion and to characterization factor of the feed was unsuccessful. Other variables such as reactor temperature, kind of catalyst and its activity, etc., are necessary if octane number is to be correlated.

The results shown here are quite different from the results obtained in studying the properties of cycle stocks (this page, December 14, 1953, p. 157). Both the conversion and the characterization factor of the feed stock vitally affect the characterization factor (and the diesel index) of cycle stocks.

References

1. Simpson, T. P., Evans, L. P., Hornberg, C. V., and Payne, J. W., "Thermofor Catalytic Cracking Process," The Oil and Gas Journal, Nov. 12, 1942, p. 96.
2. O'Donnel, J. P., "First Commercial T.C.C. Unit Goes on Stream, Adding New Aviation-Gasoline Capacity," The Oil and Gas Journal, October 14, 1943, p. 30.
3. Thomas, C. L., Anderson, N. K., Becker, H. L., and McAfee, J., "Cracking With Catalysts," Pet. Engr. Reference Annual, 1944, p. 195.
4. Anon., "Design and Operating Features of the Smallest Fluid Catalyst Cracking Unit," Pet. Engr., May 1945, p. 135.
5. Armistead, G., "Modern Refining Processes," booklet reprinted from The Oil and Gas Journal (articles appeared between March 2, 1946, and May 17, 1947), p. 9.
6. Read, D., "Cracking and Thermal Reforming . . . Pennsylvania Stocks," The Oil and Gas Journal, March 4, 1948, p. 72.
7. Kimball, T. B., and Scott, J. A., "Refinery Tools for the Manufacture of High-Octane Gasoline," Pet. Proc., July 1948, p. 659.
8. Resen, F. L., "Lower Investment, Plus More Efficient Operation to Pan-Am Southern at Destrehan," The Oil and Gas Journal, March 22, 1954, p. 214.
9. Jacobs, R. W., "Panhandle's Kitten Cracker Has 1,250-Bbl. Daily Charge," The Oil and Gas Journal, June 29, 1950, p. 81.
10. Brown, H. A., and Sterba, M. J., "Raw Crude Oil Is Charged Directly to 2,600 b/d Catalytic Cracking Unit," Pet. Proc., August 1949, p. 878.
11. Sterba, M. J., "Sulfur Content of Catalytically Cracked Gasolines," Ind. and Eng. Chem., December 1949, p. 2680 (Plant results).
12. Grote, H. W., and Olsen, C. R., "Pilot Plant Evaluation of Fluid Cracking Catalysts," Petr. Ref., November 1947, p. 104.
13. Weber, G. H., "Pure's Fluid Cat Cracker at Heath, Ohio, Proves Flexible in Initial Period of Operation," The Oil and Gas Journal, January 6, 1949, p. 81.
14. Richardson, R. W., Johnson, F. B., and Robbins, L. V., "Fluid Catalyst Cracking with Silica-Magnesia," Ind. & Eng. Chem., August 1949, p. 1729.
15. Thomas, J. E., "Fluid Catalytic Cracking of High Sulfur Stocks With Natural Catalysts," The Oil and Gas Journal, March 23, 1950, p. 221.
16. Murphree, E. V., "Fluid Catalytic Cracking Process," A.C.S. New York meeting, Sept. 1951. Progress in Pet. Tech.
17. Same as 11, Pilot-Plant Results.

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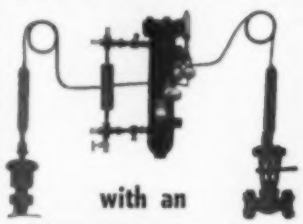

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Among the Drilling Contractors

Durham Drilling Co. is to drill an 8,000-ft. Morrison test for Humble Oil & Refining Co. at a wildcat location in South Blanco area, 2 miles southwest of Tapacito, in Rio Arriba County, northwestern New Mexico. Designation of the test is 1 Jicarilla-Apache "O." Spot location is in 10-25n-4w. It is off the southeast end of the big San Juan gas area.

Harkins & Co., Alice, Tex., is under contract to Motex Oil Co., of San Antonio, for a 7,500-ft. test in southwestern McMullen County, Southwest Texas. Location, in I&GN Survey (Abstract 278), is 18 miles northwest of Freer, in Duval County. It is about 5 miles northeast of the shallow (Mirando sand) Munson field, nearest production. It is on Motex's Nueces Land & Livestock Co. lease.

J. I. Roberts Drilling Co., Shreveport, is on a 9,875-ft. Cotton Valley test in Calhoun field, Ouachita Parish, North Louisiana. It is a contract job for Arkansas Louisiana Gas Co. at 1 Pipes Estate, in 33-18n-1e, just outside the town of Calhoun. Location is about a mile southeast of the field's discovery well drilled by California Co. in 1948. It produced gas and condensate from the Cotton Valley-Vaughn sand at 9,577-9,873 ft.

Green & Heiser Drilling Co., Bakersfield, Calif., is getting under way on another test for Superior Oil Co. in the McClung area, 8½ miles southwest of Bakersfield, in Kern County, California. It is Superior's second attempt to confirm production it opened recently in the Upper Stevens sand at 7,700 ft. Superior's first confirmation attempt was dry at 8,350 ft. Its operation is 86-33 Easton, in 33-29-26.

Greyhound Drilling Co., Shreveport, has a new wildcat operation about 4 miles northeast of Stonewall, in DeSoto Parish, North Louisiana. It is a 6,400-ft. Travis Peak test for C. R. Gallagher, of Lubbock, Tex. Location, at 1 Roach Farms, in 12-15n-14w, is about 3 miles northeast of Stonewall field, nearest production.

Hayden-Farmer Drilling Co. is about finished on the first of two 5,500-ft. Woodbine tests it has contracted to drill for Trice Production Co., of Longview, in the vicinity of Jacksonville, in North Central Cherokee County, East Texas. Initial operation is at 1 McNeil, in the Thomas Quevado Survey, 2½ miles north of town. Upon completion of this job, the rig goes to 1 Pressler, about ¾ mile south, and about 1¼ miles north of town. The area is about 2 miles southeast of production in Tecula field.

Justiss-Mears Drilling Co., Jena, La., is making hole on a deep test it has contracted to drill for Jett Drilling Co., Inc., and Harry G. Newman south of McNair, in southern Jefferson County, Mississippi. Contract calls for a lower Tuscaloosa test with objective about 10,700 ft. Location is at 1 Georghegan-Groome Unit, in 32-8n-2e. It is about 2¼ miles north of Odenburg field, across the line in northern Franklin County.

Trend Drilling Co., Corpus Christi, Tex., has a rig under contract to Hawn Brothers, also of Corpus Christi, and Associated Oil & Gas Co., of Houston, for a 5,800-ft. test 4 miles southwest of Alfred, in northeastern Jim Wells County, South Texas. Location, at 1 Almond, in Section 13, HT & B Survey, is about 1½ miles west of Almond field, nearest production.

Del Mar Drilling Co., Corpus Christi, Tex., is to drill a 7,100-ft. exploratory test off the north flank of the old Saxet field, west of Corpus Christi, in Nueces County, lower Texas Gulf Coast. It is a contract job for Tri-Mark Oil Co., also of Corpus Christi. Location is carried as 18 Driscoll Estate. It is spotted in the W. S. McGregor Survey. It is just east and south of the Viola area.

Santa Fe Drilling Co., Santa Fe Springs, Calif., is drilling an 8,500-ft. test for Hancock Oil Co. in the newly productive McClung area, south of Greely and 10 miles southwest of Bakersfield, in Kern County, California. The test, 53-33 Easton, offsets Superior Oil Co.'s recently completed Stevens-sand oil discovery.

Casey & Montgomery, Bakersfield, Calif., moved a heavy-duty rig from the Arvin area to Rio Bravo field, in Central Kern County, California, for another deep well for Union Oil Co. of California. The new operation is

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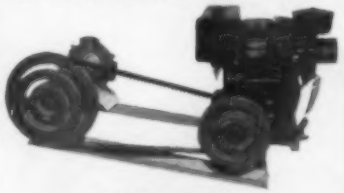

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at 82K-28, in 28-28-25, near Shafer. Its objective is the 11,600-ft. Helblingsand pool, opened by Union in 1953. Thirteen wells have been completed in the deep pay.

Longhorn Drilling Co., Three Rivers, Tex., is drilling on an 8,300-ft. wildcat test 2 miles southeast of Oakville, in North Central Live Oak County, South Texas. It is a contract job for Blanco Oil Co. at 1 Briam, in the Dennis McGowan Survey. Location is west of Marsden field, opened by Henderson Coquat, principal owner of Longhorn Drilling Co.

Penrod Drilling Co., Shreveport, will drill a deep wildcat test 3½ miles northwest of Plain Dealing, in northern Bossier Parish, North Louisiana. It is another contract operation for Hunt Oil Co., its affiliated producing company. The test, 1-A Bolinger, is scheduled to go to the Smackover about 11,400 ft. Location, in 21-23n-13w, is about 2 miles west of Tokio production at Plain Dealing, and about 2½ miles northwest of Pettet production at Bolinger. It is near the Arkansas line.

Trend Drilling Co. is on a new contract job 4 miles southwest of Alfred, in northern Jim Wells County, South Texas. It is a 5,800-ft. wildcat test for Hawn Brothers and Associated Oil Co., of Corpus Christi. Location, 1 Almond, in H&TB Survey 13, is about 1½ miles west of Almond field.

Bullard Drilling Co., Houston, has a new operation going for Union Oil Co. of California in the Live Oak area of Vermilion Parish, Coastal Louisiana. It is Union's 3-D Louisiana Furs, in 28-14s-3e. Location is off the west side of the field. Rig is set up to go to 13,500 ft.

Burch Drilling Co., Inc., is a newly formed contract-drilling firm operating in West-Central Kansas. Headquarters are at Wichita. Earl M. Burch, president, formerly was general manager of Century Production Co. Previously, he was chief geologist for National Cooperative Refinery Association. The firm is starting with one rotary rig, capable of drilling to a depth of 5,000 ft.

Graham-Michaelis Drilling Co. is on a new contract job 11 miles southwest of Johnson, in southern Stanton County, far-western Kansas. It is drilling for William Gruenerwald, of Chicago. Location, 1 Dewell, in 28-30s-41w, is 4 miles east of Sparks field, about midway between it and the west edge of the Hugoton gas area. A 5,400-ft. test is planned.

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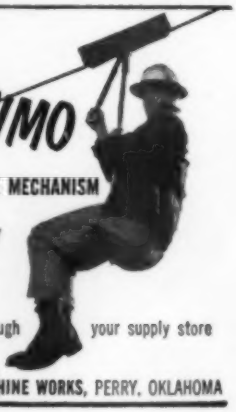

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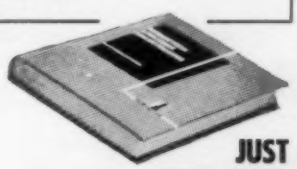

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Three pipelines share process center

by R. L. Lockwood

A PROCESSING center for production accounting for three eastern common-carrier pipelines has proved its economy after 2 years' operation.

The chief accomplishment of this installation, located in Oil City, Pa., is the elimination of manual reference to tank tables. Runs are calculated automatically by processing punched-card master decks together with a daily oil-run ticket through a Remington Rand Univac 120 punched-card electronic computer. This information is then run through punched-card equipment. The system produces all reports required for buyers, producers, and royalty-interest accounts, as well as internal and statistical reports for each common-carrier pipeline.

Participating companies in this venture are Buckeye Pipe Line Co., Eureka Pipe Line Co., and National Transit Co.

This approach to the problem of oil accounting is unique. The successful application of the computer to the automatic calculation of run tickets did not justify buying a computer for one company alone. But by joining with other common carriers having a similar problem, enough volume was created to save money over manual methods. Each pipeline enjoys the economies of a central processing center and still retains management controls of production-department functions.

This application of automatic processing of run tickets is in the forefront of such installations in the oil industry.

Reason for system . . . Oil accounting is in a class of its own. The pipeline industry, in performing its duties of gathering and transporting crude, has traditionally rendered extraordinary accounting services to the producers, royalty owners, and purchasers of crude. These services are over and above those rendered shippers by other forms of transportation, such as railroads, truckers, and water carriers.

All three of the pipeline companies have performed such services and absorbed these costs, originally under far more profitable operating conditions than have existed for half a century. As volumes of crude produced and gathered in the areas serviced have declined, the cost of rendering these services has worsened faster than adjustments could be made to correct the situation.

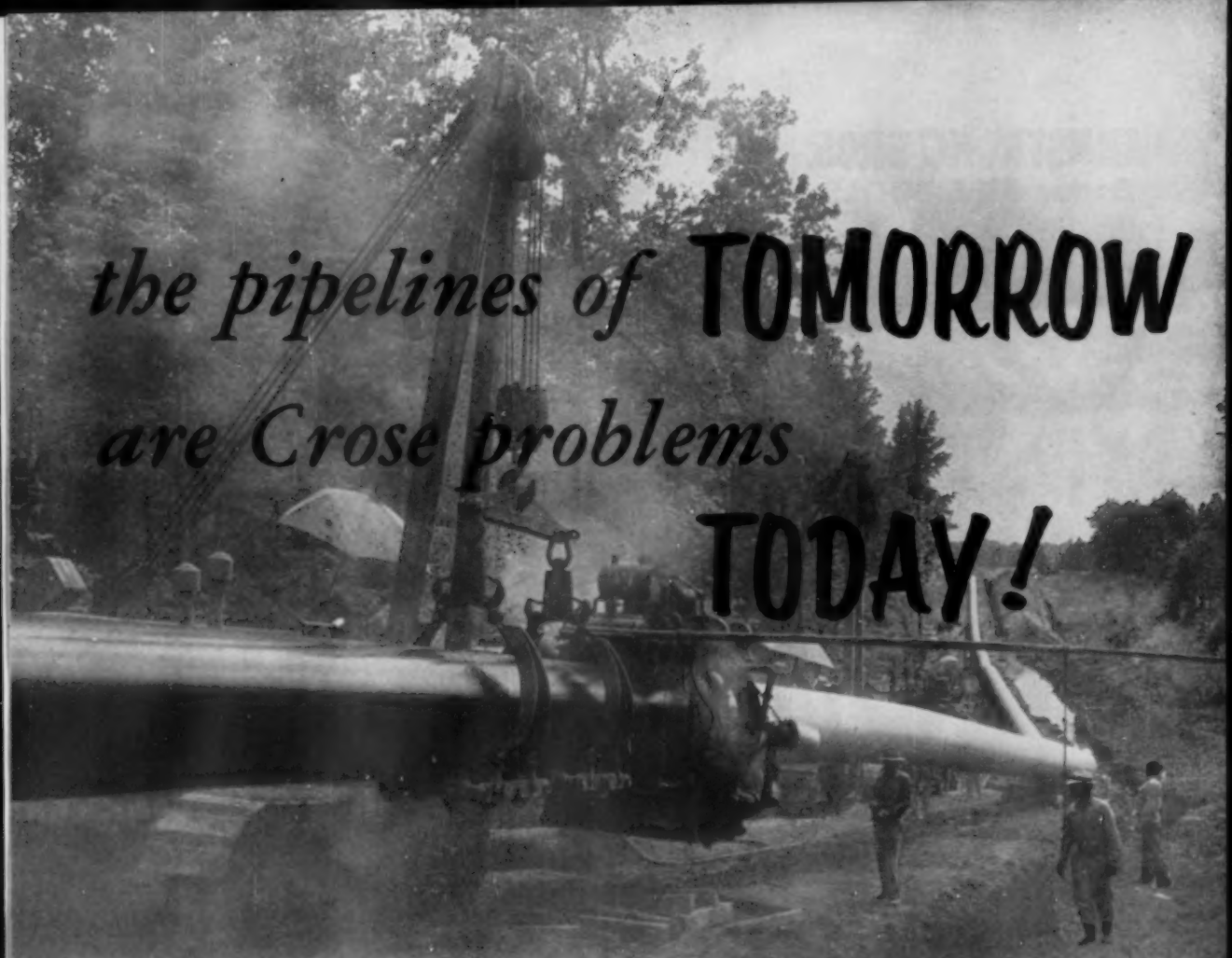
Personnel trained over a long period of time were able to give special attention to accounts. They performed services far beyond the basic requirements of the average account. Time has thinned their ranks. And to avoid an increase in gathering rates or additional charges to shippers, the three pipeline companies joined together in mechanically processing the production-department accounting. By so doing, they cut costs enough to continue standardized accounting services.

Automatic accounting . . . Until the centralized processing center was set up, each company had its own accounting system and schedule of reports which were furnished to producers and buyers. Under the new system, these procedures have been made uniform for all three and adapted on a common basis to the electronic and tabulating equipment.

The pipelines, upon accepting custody of oil from producers for transportation, issue run tickets (similar in purpose to a railroad way bill). These are an indication of the work load and basis for determining the amount of work required of the processing center. The number of these tickets processed during 1956 totaled 118,620, or an average of 9,885 per month.

Punched-card master decks cover 18,259 shipping tanks. The work load is pointed up by the fact that account cards exceed 40,000 per month.

Author is president, National Transit Co.



Crose engineering and research is constantly working to develop new and better pipeline construction equipment. The 36" cleaning and priming machines — coating and wrapping machines used on the Transcontinental Gas Pipeline job were the result of Crose engineering and research. The machines, largest of their kind, show the forward thinking of Crose designers. Whatever equipment tomorrow's pipelines will demand — you can bet that Crose will build it.

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Manufacturing Company, Inc.

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"ARMSTRONG BROS." Three wheel and Standard wheel and roller Pipe Cutters are quality cutters throughout . . . built to give years of good service.

"ARMSTRONG BROS." drop forged Pipe Cutters are built for lifetime service with 1-piece drop forged steel heat treated body and a replaceable hardened steel nut to take up the wear and thrust of handle screw. Used either as 1-wheel (with 2 roller) or 3-wheel (for close quarters).

"ARMSTRONG BROS." Knife Blade Cutter Wheels are machined from special alloy tool steel properly heat treated. They cut rapidly and easily, hold their keen edge.

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PIPELINE PATROL

Some four account cards are involved in tabulating each run; an account card represents the division of interest in the oil.

The procedure in handling this form of accounting for the three companies is fairly simple. Run tickets are mailed to Oil City daily by the men in the field who gage producers' tanks. A run ticket shows the foot measurement before the gager breaks the seal and starts a flow of oil, and after the flow has stopped and the tank has been resealed. The ticket identifies the producer, oil tank, and notes the date on which the oil was run.

This information is punched in tabulating cards the day it is received. Fixed information needed for completing reports includes gager's district, number of the farm where a tank is located, tariff area, county, name of the farm, division of interest in the tank, etc. This is kept punched into a tank statistical card.

Running comprehensive reports is a relatively fast procedure. It is done by use of these cards, a division of interest deck, and information in a written history kept for each tank folder file which is punched into the master deck.

The master deck comprises all fixed information while the run tickets represent the variables in accounting. The listing of all run tickets serves as a guide for extracting master or fixed data for each tank run.

Oil-run tickets are collected with a reproduced deck of the master file. Next, the computer calculates the gross barrels, net barrels after temperature adjustment, and the division of interest in net barrels, all in one quick pass.

This calculation must be precise. All oil entering the pipelines must be accounted for to the nearest hundredth of a barrel.

After the computer run, the cards are separated. Only the oil-run tickets, tank statistical cards, and the division-of-interest cards are used to prepare final reports. These reports include a series of daily and periodic summaries showing data on the total barrels run into the systems of the three participating companies and information to producers covering oil accepted for delivery.

Reports also tell producers to what buyer their oil was credited. In turn, the pipelines report to the buyer how much oil is credited for delivery to his refinery and from which producers' tanks it came.

Benefits . . . Direct costs will be reduced further as other accounting operations are placed on the electronic equipment. Even with this work load there will be considerable time available on the machines for still more processing. Since the processing center is already set up to serve three companies, it would be a simple task to add to the program.

A.S.C.E. Organizes Pipeline Under Crossings Committee

THE Pipeline Division of the American Society of Civil Engineers has organized a Committee on Pipeline Under Crossings of Railroads and Highways. Its first job is to recommend a standard specification for crossing under railroads and highways to eliminate the trouble caused by the numerous existing specifications.

Chairman of the committee is J. E. Thompson, superintendent of pipeline construction, Natural Gas Pipeline Co. of America, Chicago. The committee is composed of 25 engineers. Members represent liquid and gas-pipeline companies, the American Railway Engineering Association, railroads, the Federal Power Commission, American Standards Association, the Bureau of Public Roads, state highway departments, toll-road authorities, the American Concrete Pressure Pipe Association, Iowa Commerce Commission, the American Gas Association, American Petroleum Institute, Southern Gas Association, and other groups.

Need for standard . . The need for a standard for pipeline crossings has become more urgent as longer and larger-diameter pipelines are built. They cross hundreds of different state and local highways and railroads. The committee, in pointing out the need for uniformity, cites the different specifications which divisions of the same railroad may have for the same class of road. Mny highway departments are adopting codes which

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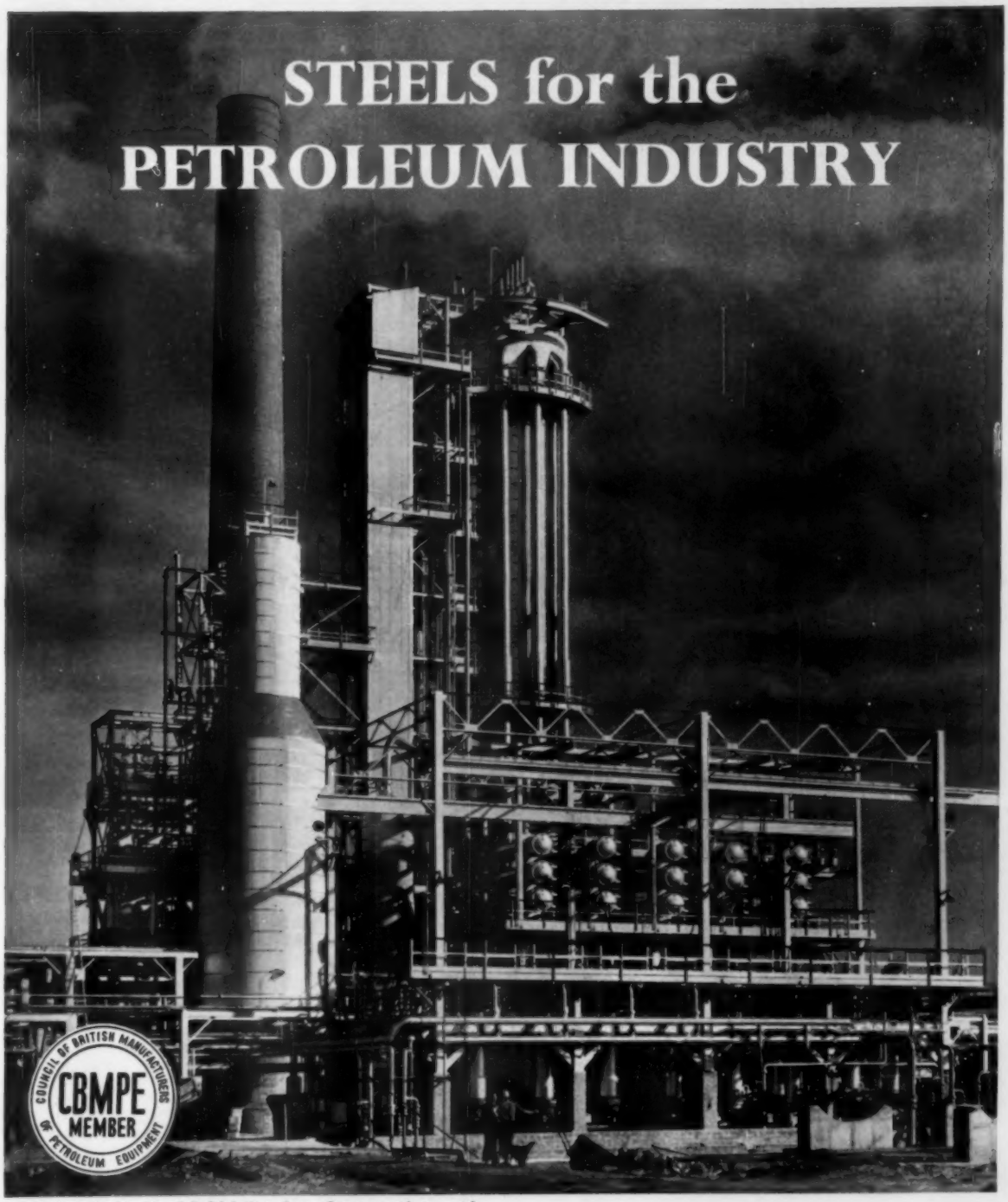

"A Symphony in Steel"—A British Petroleum Company photograph.

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DEMANDS MOBILE HOUSING

You don't have to build and abandon expensive field camps anymore. You can keep your housing right with you, moving with your business . . . your employees will be happier with their families . . . and they can't be better accommodated than in SPARTAN mobile units.

SPARTANS are built for rugged use . . . riveted, all-aluminum construction . . . with the finest interior design and appointments for family living . . . practical comfort and convenience for field offices, kitchens, diners, bunk houses, and other custom units.

Some of America's greatest companies have turned to SPARTAN for the best in custom design for particular jobs. *

*Williams Brothers, internationally-known pipeline construction firm, will be using 57 SPARTAN mobile units for various field housing purposes on a pipeline job in Turkey.

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SPARTAN
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Pipeline Patrol

vary for the same class of construction.

Because of this situation, it's increasingly difficult for pipeline companies to obtain proper materials and design for each individual condition. Pipeline materials often must be ordered 2 years in advance of construction—many times before crossing-permit data is available. The committee feels that a properly developed standard could make it easier to issue crossing permits. It would cut down the volumes of correspondence often necesary for a single pipeline crossing. Railroads and highways themselves have a stake in a good standard. It would assure a safe, well-engineered crossing.

Function of committee . . . The A.S C.E. committee will assemble information from all interested organizations. It isn't a code-writing organization.

The A.S.C.E. points out that it is representative of all the interests involved and isn't trying to suggest a code tending to favor any single group. Pipeline companies naturally will have to conform to existing piping codes and to the loading design of the highway or railroad.

The A.S.C.E. committee will develop a tentative specification acceptable to its members, then submit it to the American Standards Association. If the A.S.A. adopts the proposal, it will become a standard code for pipeline under crossings of railroads and highways.

The committee invites participation from groups affected by the problem.

BOOK

THE PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE, Eleventh Edition, published by Lincoln Electric Co., Cleveland 17, Ohio. 1,300 pp. $3.

This is a major revision of this well-known arc-welding reference book. A major portion of the book has been rewritten completely. All of it has been reviewed closely and brought up-to-date. The book is arranged and written as a reference book covering all phases of arc welding. Its contents range from the early history of arc welding to the intricacies of structural design. The book is divided into eight sections: history, nomenclature and processes, weldability, mild steel procedures, manufacturing cost data, machine design, structural design, applications and reference data.

There is a discussion of the theory and application of the rigid frame and plastic design systems. Details on the design of structural members and joints are included. A group of charts and nomographs simplify design calculations. Applicable codes have been condensed to usable size and are included.

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When all the costs are totaled up at the end of the job Nelson's ease of installation and compact design will let you beat the estimate.

And even that is not the whole story. Nelson's coordinated design, using components specially selected for long trouble-free service, means less maintenance cost down through the years. If saving money is important you will specify and buy Nelson motor control centers.

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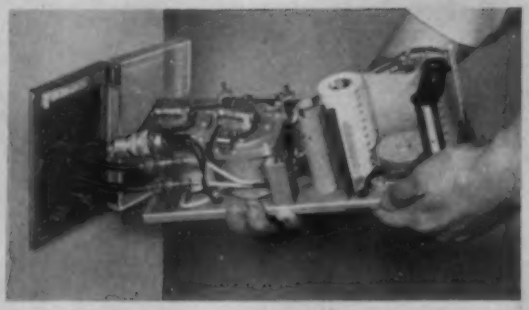
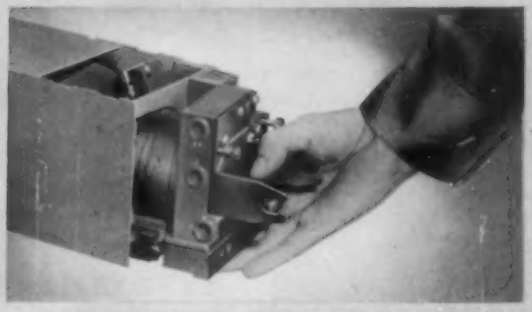


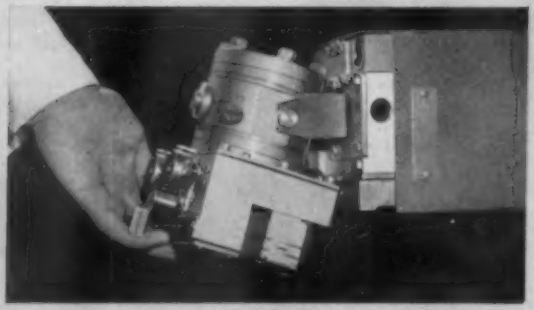
Easily Serviced—All parts can be inspected during operation, without process interruption. To remove chassis completely, unscrew three finger-tight, self-sealing connections.

Interchangeable Chassis—Change recorder to indicator or vice versa without interrupting control. Simply pull out chassis, slide another in place.

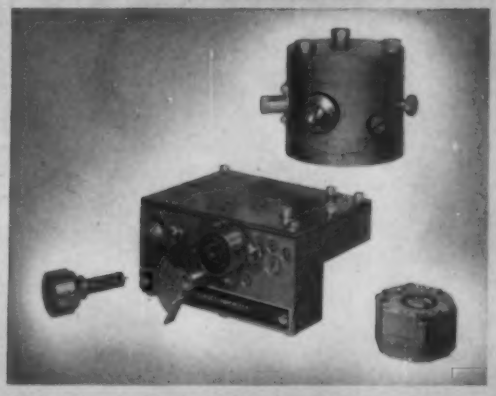
Now you can gain ... Extra



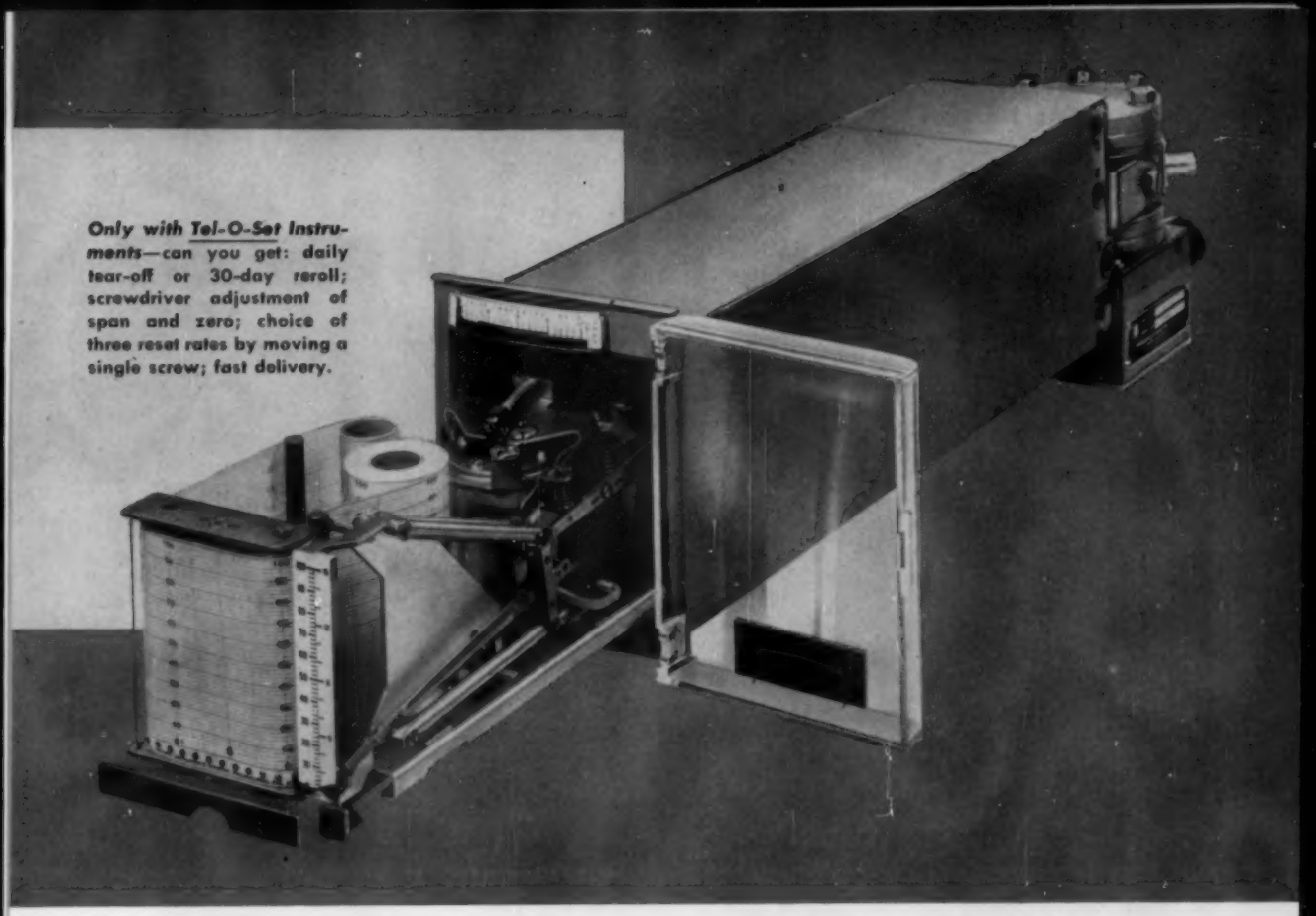
Removable Regulator—Pneumatic assembly, consisting of regulator and switches, can be removed from rear of case without disturbing electrical connections—no need for an electrician to stand by.



Quick-connect Mounting—Controllers have quick-connect switch permitting removal of the unit while process remains on manual control.



Easily Disassembled—Unitized construction of all controller components simplifies maintenance . . . makes reassembly foolproof. No need to dismantle stack to clean pilot assembly.


Only with Tel-O-Set Instruments—can you get: daily tear-off or 30-day reroll; screwdriver adjustment of span and zero; choice of three reset rates by moving a single screw; fast delivery.

Savings with TEL-O-SET*

. . . advanced miniature pneumatic instruments

Tel-O-Set miniature instruments accurately record, indicate, and control process variables. They're applicable to any process variable . . . a savings in itself. And, further savings are accrued from these factors: Only a few models are needed for *all* applications . . . Personnel training time is minimized . . . Spare parts inventory is reduced . . . Process techniques can be changed without buying new instruments. The photographs point up some of the outstanding *Tel-O-Set* features.

For complete information on *Tel-O-Set* instruments, write for Catalog C 1001-1, or call your nearby Honeywell sales engineer. He's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

*Trade name Minneapolis-Honeywell Regulator Co.

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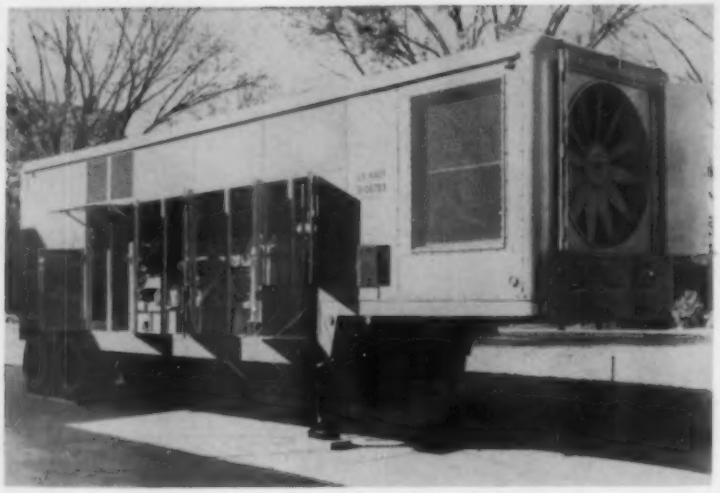
BROWN INSTRUMENTS
First in Controls

SHOWCASE...

NEW EQUIPMENT



Mobile Generating Plant Delivers 675 Kw.

At construction sites or isolated installations, or for emergency or maintenance work, this trailer-mounted diesel generating plant may prove valuable. Rated at 675 kw. for continuous, heavy-duty service, the self-sufficient plant meets size and weight requirements for over-the-highway movement, according to the manufacturer.

The plant illustrated is 36 ft. 2 in. long, 8 ft. wide, and 12 ft. 6 in. high. It weighs 72,000 lb., less than 107 lb. per killowatt of capacity. Yet this weight includes a six-cylinder opposed-piston diesel engine rated at 962 hp. at 720 r.p.m., a generator, switchgear, control equipment, complete cooling, lubricating, and fuel systems, a starting air compressor, and an auxiliary engine.

Thus, after the unit is hauled to the spot where power is needed, it can start delivering 675 kw. immediately after it is hooked to the distribution line. Two or more units can function as an integrated plant, quickly providing any required power supply.

In addition to the 675 kw. plant, three smaller trailer-mounted generating stations, rated at 350, 400, and 500 kw., are available. **Write or call Fairbanks, Morse & Co., 600 South Michigan Avenue, Chicago 5, Ill., for details on 675-kw. mobile generating station.**

●

Oil and Gas Separator Uses Short Shell Length

This new short-shell-length separator, known as the COG (for maximum conservation of oil and gas), is a vertical low-pressure unit using the shortest practical shell length, the maker states.

It is designed to operate at the lowest possible pressure, yet have sufficient pressure to push oil through the lines and into tanks, while preventing oil carryover into gas lines.

According to the maker, the separator can save oil each time a well is opened to flow. And it permits the use of small pipe and fittings for tank-battery hookup.

The COG separator is available in a complete range of sizes and capacities. **Write or call: National Tank Co., Drawer 1710, Tulsa, Okla., for details on COG separator.**

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

.....

Described in OIL AND GAS JOURNAL - Issue of May 6, 1957

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

DATE.....

Air-Conditioning Unit Speeds Tank Cleanout

More efficient repairs and cleanouts in tanks, pressure vessels, and other locations may be done in a fraction of the time normally required, thus decreasing shutdown time, through the use of this portable ice air-conditioning unit, the maker states. And it may provide safer working conditions for personnel.

According to the maker of the unit, the reduction of internal temperature and humidity in the tank or vessel results in a reduction of the volatility of any existing oil or chemical and so a reduction in vapors which could cause fire, explosion, or other harmful effects to personnel. It also allows crews to work continually without the necessity of cool-air breaks.

The Ready Cool air-conditioning unit is small—the 60-ton size is only 15 ft. long. It is entirely portable and easy to install. The unit comes in standard sizes with capacities of 20 to 60 tons. Through the use of ice, pressure vessels are eliminated. **Write or call: South House, Inc., 2301 American Bank Bldg., New Orleans, La., for details on Ready Cool unit.**

●

Fracturing Trailer Develops Increased Horsepower

With this Halliburton 1,200-hp. HT-400 fracturing trailer, larger volumes and higher injection rates are available from the maker's twin-pump mobile service unit. Maximum pumping volume is in excess of 30 bbl. per minute. Injection pressures of up to 14,000 psi. can be reached.

Each of the two HT-400 pumps is powered by a 600-hp. Cummins V-12 diesel. Laboratory and initial field runs in regular use indicate that each pump delivers more than 575 hydraulic horsepower.

The HT-400 pump is designed to operate efficiently in extreme temperatures such as high desert heat or subzero cold. A built-in heat exchanger heats or cools as climatic conditions demand. The weight ratio of the pump is only 8.75 lb. per horsepower.

competition *makes it better!*

Competition spurs men on to new heights. It can't help but give you the best approach and best solution to any problem. Competition makes oil well cementing service better, too. We're proud that BJ Service, Inc., *put* competition in the business and we plan to *keep it there.*

Engineered answers to oil well cementing

BJ SERVICE, INC.

For Details, see page 195

SHOWCASE . . .

New Equipment

Where oil is employed as the fracturing medium the use of diesel engines reduces the fire hazard within the equipment.

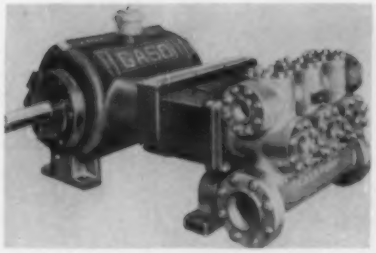
Four sizes of the pump are included in the HT-400 series. Each one is designed to fit the area requirements for fracturing.

Torque transmission from the gear to the crankshaft is through a splined coupling, which acts as the alignment joint between the two. **Write or call: Halliburton Oil Well Cementing Co., Duncan, Okla., for details on the HT-400 fracturing trailer.**

●

Triplex Plunger Pump Provides High Capacities

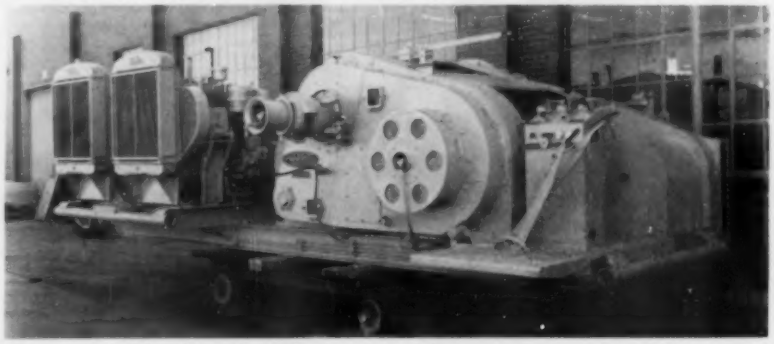
Where moderate capacities and medium - to - high pressures are required for crude-oil-gathering systems, movement of refined petroleum products, salt-water disposal, water flooding, and fresh-water supply, this new high-speed single-acting Fig. 3466 (2½ to 3½



by 4-in.) horizontal triplex plunger pump may be of value.

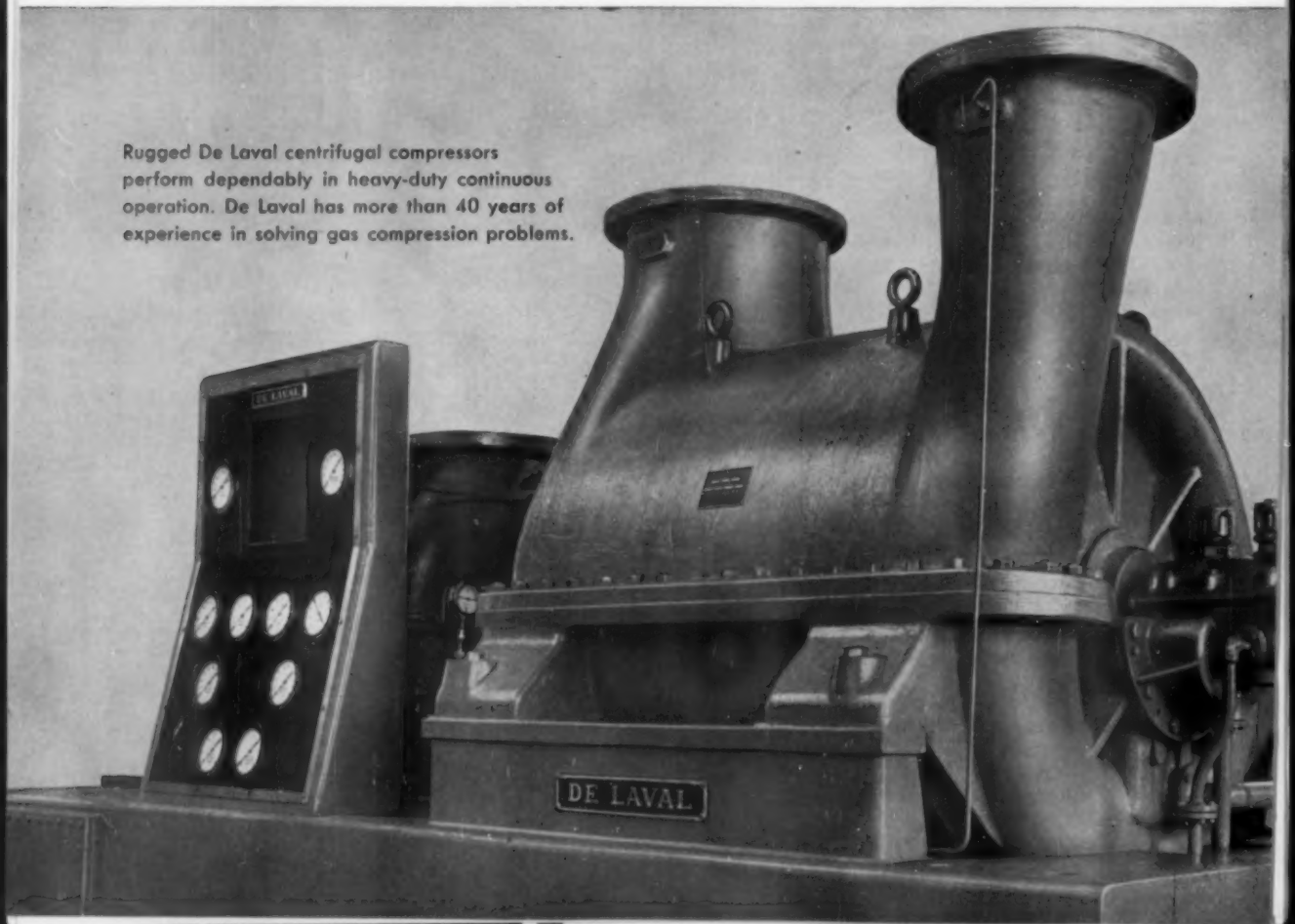
Its maximum speed is 250 r.p.m. And its maximum capacities range from 91 bbl. per hour at 1,180 psi. to 179 bbl. per hour at 600 psi.

The fluid-end body is available in molybedum - alloy iron, aluminum-bronze alloy, or cast-alloy steel to meet various operating conditions. The pump is available as a complete skid-mounted unit with a gas, gasoline, or diesel engine or an electric motor. **Write or call: Gaso Pump & Burner Mfg. Co., Tulsa, Okla., for details on Fig. 3466 pump.**



Draw Works Is Torque Converter Equipped

This new Cardwell L-350 is a compact, single or twin-engine double-drum torque-converter-equipped draw works using plate-frame construction to



Rugged De Laval centrifugal compressors perform dependably in heavy-duty continuous operation. De Laval has more than 40 years of experience in solving gas compression problems.

achieve a high strength-to-weight ratio and to permit oil-bath lubrication to all chains. It's readily adaptable to various trailer mountings as well as conventional skid masts.

All controls are centralized and mounted in a simplified control panel which allows the driller full view.

Fawick clutches, when used with the torque converter, provide instant selection of a full range of line speeds and pulls. The high and low drum clutches, exterior mounted on the main drum shaft, provide easy accessibility when servicing is required. A 15-in. double-rotor hydromatic brake, complete with a Fawick disconnect clutch, is internally mounted and chain driven.

All standard makes of air-actuated breakout and manually operated friction spinning catheads are available. The optional sand-line drum is located to permit a low over-all height. **Write or call: Cardwell Mfg. Co., P. O. Box 2001, Wichita 1, Kans., for details on L-350 draw works.**

Safety Panel Protects Unattended Engines

Continuous protection and automatic operation of unattended or remotely controlled engines for oil rigs, air compressors, and generator sets are provided by this new expandable safety panel. It automatically shuts off engines should oil pressure drop to a low level or the engine water temperature rise to a high point.

Available for engines with either battery or magneto type of ignition, as well as diesel engines, the panel includes precut holes for the insertion of a tachometer, hour meter, or other instruments or gages as needed in any particular installation to facilitate clocked maintenance or inspection.

The minimum pressure levels and maximum engine temperature at which it is desired to shut off the engine are factory-set at 5-lb. oil pressure; 25-lb. water pressure, and 205° F., respectively. But all may be adjusted to fit a particular need. **Write or call: Stewart-Warner Corp., 1826 Diversey Parkway, Chicago 14, Ill., for details on expendable safety panels.**

●

Indicating Tape Changes Color When Pipe Leaks

When this plastic indicating tape is wrapped around acid or caustic-transport pipelines, it will indicate, by a discoloration of the tape, anywhere a leak or weep develops. Useful primarily in areas where leaking acid or caustic would be a hazard to personnel, it is also suited for liquid-transport

DE LAVAL
CENTRIFUGAL COMPRESSOR

helps boost cat-cracker capacity at Shell Oil of Canada, Limited

To obtain extra capacity, the Montreal East refinery of the Shell Oil Company of Canada, Limited decided to rebuild its cat-cracker. Since the modernized cracking unit required a greater volume of air, Shell of Canada selected a dependable De Laval centrifugal compressor handling 16,400 cfm.

This compressor operates at an inlet pressure of 14.3 psia and a discharge pressure of 42.8 psia. The power required is 1860 bhp with the compressor operating at 5400 rpm.

The Shell Oil Company of Canada, Limited is another refinery which has chosen De Laval compressors for heavy-duty continuous service. Whether you need to handle light or heavy gases at high or low pressures in catalytic cracking, reforming, alkylation, coking or any similar service, it pays to look to De Laval.

Send for Bulletin 0504

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY

810 Nottingham Way, Trenton 2, New Jersey

DL376

New Equipment

areas where leakage could damage equipment.

The tape is made of fiber glass with a vinyl covering and coated with a patented indicator. Acid lines are covered with a red-colored indicator.

The tape is covered by a thin protective coating to prevent triggering by fumes or climatic conditions. **Write or call: Neirad Industries, Inc., P. O. Box 865, Darien, Conn., for details on indicating tape for pipelines.**

Plug-In Fire Alarm Provides Safety

This Plug Alarm, a small, compact electrical unit is designed to serve as a night watchman. In case of fire, the sudden rise of heat will cause the alarm to sound loud and clear. The thermostat control is set for about 140° F., at which point the alarm is sounded and will continue unless the temperature drops to about 100° F., automatically stopping the alarm.

A feature of the Plug Alarm is that any convenient standard electrical outlet is a fire station. Its safety lock is designed to hold the unit securely in place, preventing tampering.

Power is used only during sounding of the alarm. Periodically, the Plug Alarm can be tested simply by applying heat (even a lighted cigarette) to the small black disk at the front. **Write or call: Gardner Laboratory, Inc., Bethesda 14, Md., for details on Plug Alarm.**

FOR FAST, HIGH-QUALITY PIPE-LINE WELDING

this team's a winner every time

Fleetweld 5-P, E-6010

For stringer beads, vertical up or down. Designed for deep and uniform penetration. Produces a good interior or backside bead. Fast freeze and good follow, easy cleaning. Deposit is free of windows and pinholes. Operates in all positions on DC. Fleetweld 5-P sets the pace for speed and quality.

Shield-Arc 85-P, E-7010

Especially designed for vertical down cover passes on pipe, Shield-Arc 85-P operates well in all positions. It is excellent for welding both low-carbon and high-tensile pipe. Is smooth flowing, has high melt-off rate and low slag loss. Operates on DC.

This is a "natural" pair, each custom designed to complement the other's high quality and easy operating characteristics. Both electrodes conform to or surpass A.W.S., and A.S.M.E. specifications. Try these electrodes for better pipe-line welding at lower cost.

Write for Weldirectory SB-1351 for details and specifications.

THE LINCOLN ELECTRIC COMPANY

Dept. 5121, Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

When Lincoln electrodes Have proven dependability Yet are fastest operating

WHY use anything but "Fleetweld" and "Shield-Arc"

Pumping Control Features Compact Construction

Compact construction is a feature of this new unit designed to provide automatic control for timed-cycle oil-well pumping operation. Weighing less than 100 lb., the mechanism incorporates an across-the-line magnetic starter.

Protected by three overload relays, it's equipped with a three-position selector switch. Short-circuit safety for the starter, motor, and load-side wiring is provided by a front-operated fusible switch.

The complete unit is contained in a raintight N.E.M.A. III enclosure with dripproof hood. Insect-protection shields cover all ventilating openings. The enclosure itself may be pole, wall, or crossarm mounted, without additional fittings, by means of a special bracket attached. **Write or call: Federal Pacific Electric Co., 901 Regal Row, Dallas, Tex., for details on oil-well pumping control**

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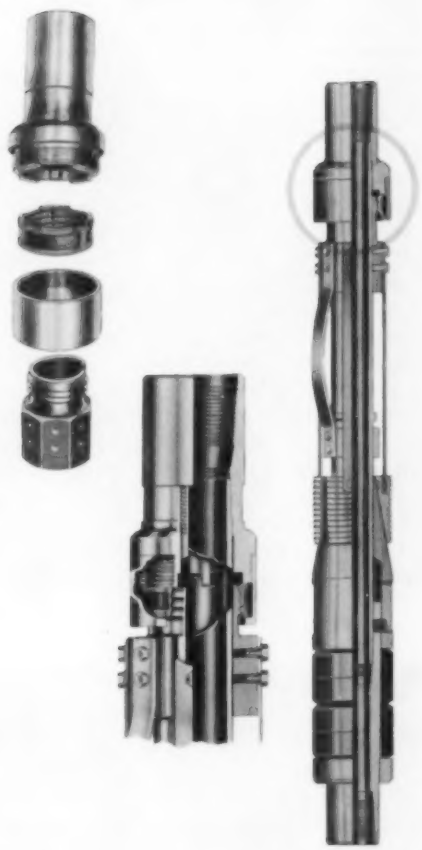
LANE-WELLS TODAY!

TOP PACKER EARNS PLAUDITS AS SAFE AND SANE TOOL



The Lane-Wells TOP Packer continues to earn the respect of oil production men everywhere the best and hardest way: by field performance. Though economically priced, its simplicity and reliability have proved it eminently suited to the vast majority of down-hole pressure jobs.

The TOP (for Tension Operated Packer) has confirmed the engineering philosophy which created it. This packer was built to do the scores of everyday jobs of fracturing, pressurizing, and acidizing where pressures are high but not extreme. Lane-Wells designers held that there is no reason why the operator should have to pay for a behemoth of a packer, with several score of moving parts, for any but the odd-ball or once-in-a-lifetime job.

Fast to run, simple to set, sure to pack off, sure to retrieve, all at a sensible price – that forms the basis of the TOP success story. And now the TOP Packer is better than ever before. A new latching mechanism has been incorporated in the TOP that permits even simpler setting with field-proof-positive unlatching and re-engagement. The friction springs have been made independent of the slips, too! This has resulted in firmer spring-to-casing contact, simpler replaceability, and has permitted the use of spring steel slip reins to reduce the possibility of their being bent while running in.

What this means to you is simply this—the TOP will provide the utmost in retrievability, packoff, resistance to upward movement, and simplicity of design at an economical price.

To get the full story on the improved TOP Packer, check H-1 on the attached card.

WANT MORE INFORMATION?

A code number appears at the end of each article. For additional information about that item circle its code number on the reply card at the bottom of page 3. Just mail the card —we'll pay the postage.

KWIK-KONE GIVES FASTER, TAILOR-MADE SHOOTING OPPOSITE LONG ZONES

Another new development in Lane-Wells Koneshot ® perforating makes it possible for the operator to shoot an extremely long zone, with a wide choice of shot spacing, on a single run. This is Kwik-Kone, an assembly of powerful Koneshot charges in aluminum containers mounted in a flat steel carrier. After the Kwik-Kone is fired, the steel carrier retrieves from the well in the same manner as the conventional round carrier.

What makes the Kwik-Kone so desirable to the operator with a long-zone shooting job is that a shooting assembly exactly appropriate to the zone or zones involved can be quickly tailor-made right at the well. Blank sections can be inserted in the Kwik-Kone assembly to straddle non-productive horizons.

Lane-Wells shooting crews have long held the reputation of getting perforating jobs done with a minimum of rig time. The Kwik-Kone enables them to shoot the longest zones with made-to-measure shot patterns and spacing with the fewest possible number of runs. In fact, most jobs can be shot on one Kwik-Kone run.

With all of their speed, the Kwik-Kone guns are of a type which achieve deep, clean penetration, and high productivity. Furthermore, they are the only ones of their type that give the operator a positive index of having been fired.

The Kwik-Kone is available in two sizes: one which will pass through a 3¼" I.D. ring; and the other which will pass through a 4¼" I.D. ring. For more information on this latest Lane-Wells Koneshot convenience, check **H-2** on the attached card.

TANDEM E-GUN MULTIPLIES SUNDAY PUNCH

The mighty Lane-Wells E-Gun can now run as twins, or triplets, to give the operator 50 or 75 of the deepest bullet perforations obtainable, all on one run. Already famous as a premium-performance gun for reaching way into tough formations through multiple casing strings, the E-Gun can now accomplish mass shooting on one run with minimum rig time.

And the E-Gun's versatility has been increased with tandem shooting, too. The selective firing offered with the E-Gun permits you to shoot one zone from one gun section with as many as 6 shots per foot; shoot another zone with a different shot density; blast one zone with all three gun sections; or shoot practically any combination you choose to do the job – all on one run in the hole. As a matter of fact, you can shoot 75 shots in one foot, one shot every 75 feet or any place in between – you call the shots and Lane-Wells crews will put 'em where you want 'em. And never fear about accuracy – those shots will be precisely where you want them in exactly the shot density you order. That's a fact.

Ready for use in all fields, the E-Gun in tandem has been tried with outstanding success in the Rocky Mountain area, West Texas, the San Juan Basin, and the Pacific Coast. Most of the jobs in these districts were completed on one run, thus saving hours of rig time.

E-Gun perforations have proved particularly effective in obtaining production from tight or mudded-off formations. Its powerfully propelled bullets develop a radial shattering effect which increases the area of drainage over that which could be expected from

current and pertinent

SHAKY TOOL PROVIDES USEFUL DATA — A modern improvement on one of the oldest geological tools, the sieve, separates mineral content in unconsolidated and prepared sediments and provides invaluable aid in determining porosity and permeability, grain size, mineral concentration, and micro-faunal concentration. **H-3**

☆ ☆ ☆

WANT A BARGAIN? BUY CONTRACT FOOTAGE — This survey shows that today drilling contractors drill 125 feet of hole for the same price that they drilled 100 feet of hole five years ago. And this in the face of steadily rising costs of labor and materials. Contributing substantially towards this bargain-basement situation are better bits, improved hydraulic systems, better drilling mud, rig efficiency, rig mobility, slim-hole rigs, and air or gas drilling. **H-4**

☆ ☆ ☆

R/A LOGS GIVE AMPLE DATA ON GAS-DRILLED WELLS Because electrical logs cannot be run in gas-drilled wells, Radioactivity logs must be relied upon to provide the necessary downhole data. A method has been worked out whereby interpretation of Radioactivity logs in San Juan Basin wells will yield essential data on lithology, porosity, and fluid content. **H-5**

JET PERFORATING WITHOUT JET DEBRIS — The new Karrotfree Koneshot perforating guns retain the carrot, a jet-perforating by-product, within the gun. The resulting holes in the formation, being free from blocking material, yield higher production. **H-6**

☆ ☆ ☆

ICE DRILLING MAY REVEAL WEATHER SECRETS — Oil industry-type core drills are being used by U.S. Army engineers to tap literally the weather secrets frozen in the mile-thick Greenland ice cap. "Production" will consist of data on temperature, weather cycles over the past thousand years, wind currents, and the effect of the ice cap on world climate. **H-7**

penetration alone. Its depth of penetration reaches the oil beyond the mudded-off or watered-off area in the vicinity of the hole. Now that the E-Gun can be run in multiples, more than ever before can it be said that "the E-Gun gives your well its best chance to produce."

Originally designed for the unusually tough perforating job, the E-Gun has proved so effective in producing oil that many operators are using this premium tool on more-or-less routine completion jobs. They figure that the extra production makes the investment well worth while. These boys, mighty sharp with a pencil, will now find that the reduced rig time with the tandem run, will make the use of the E-Gun more attractive than ever.

Check **H-8** on the attached card for more information on this tandem perforator.

Barring the Pacific Coast and Rocky Mountain states, Texas has the highest piece of ground in the country. This is 8751-ft. Guadalupe Peak in Culberson County. Not bad for a plainsmen!

SUPER BRAIN BREAKER

Five solid iron balls with diameters of 1", 2", 4", 5", and 8" can be balanced by three solid iron balls with diameters in inches that are whole numbers. What are the diameters of these three?

ANSWER 1", 6", and 8". The volume, hence the weights, of spheres are to each other as the cubes of their dimensions.
Thus, $1^3+2^3+4^3+5^3+8^3=1^3+6^3+8^3$.

DENSILOG GIVES CORRELATION AND EVALUATION DATA

Two years of field application have confirmed the value of the Lane-Wells Densilog as a means of measuring density and porosity of formations exposed in the open hole. Originally developed by Stanolind, the method has been improved by Well Surveys, Inc., and is now being made increasingly available by Lane-Wells.

The Densilog provides information not available with any other type of logging instrument. Its readings provide the geologist and engineer with invaluable data with which to correlate formations and develop production programs.

The Densilog, run from standard Lane-Wells radioactivity logging trucks, bombards the formation with gamma rays emitted by a device held tightly against the wall of the open hole. An amount of gamma radiation inversely proportional to the density of the rock so bombarded is picked up by a detector and is recorded on a log at the surface. Since density of the rock is inversely proportional to the porosity, these density readings can readily be interpreted in terms of porosity.

Readings can be quickly corrected for fluid density and hole size by means of calibration charts.

Only core and cuttings analyses can provide the same type of information as does the Densilog. Over these the Densilog provides the following advantages: (1) rock densities are measured under subsurface conditions; (2) readings represent the densities of larger rock volumes; and (3) the Densilog is immediately available.

For additional information on this valuable new tool, check **H-9** on the attached card.

CHECK AND SIGN THIS CARD

P IT IN THE MAIL • NO POSTAGE REQUIRED

Complete information about the items appearing in this publication is available without charge to qualified oil company employees and oil well operators. Please fill out the forms completely, giving Company and Title as well as your address and indicate whether or not you want to be placed on the mailing list to receive more information on these subjects as it becomes available.

H-1	H-6
H-2	H-7
H-3	H-8
H-4	H-9
H-5	

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You get more information from Lane-Wells Radioactivity Logging because more wells in every field, including your local area, have been radioactivity logged by Lane-Wells personnel than by any other service company. This means Lane-Wells has more experience – more cumulative radioactivity logging knowledge of your local stratigraphy than anyone else. That's why you get more information – information you can rely on from Lane-Wells Radioactivity Well Logging. Call your Lane-Wells man today.

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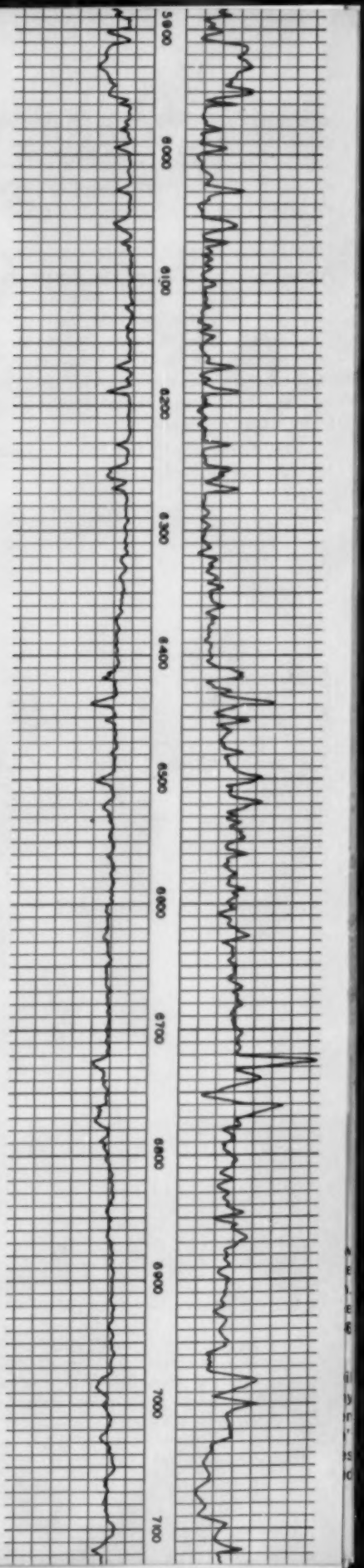

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SHOWCASE . . .

New Literature

Prestressed Concrete for tanks for processing plants, water storage, supply facilities, and water treatment is the subject of new four-page Bulletin T-15. This bulletin covers both design and construction data. It contains condensed data on the use of prestressed concrete for both containment and pressure vessels. **Write or call: Preload Co., Inc., 211 East Thirty-seventh Street, New York 16, N. Y., for Bulletin T-15.**

●

Tractor-Mounted Winches are described in this new pocket-size booklet entitled: "Facts on Carco Winches and Equipment." The 32-page booklet includes such basic information as how a Carco winch works, its primary uses in oil and pipeline work as well as facts regarding operational and engineering features and operating instructions. **Write or call: Pacific Car & Foundry Co., Fourth and Factory Streets, Renton, Wash., for booklet "Facts on Carco Winches and Equipment."**

●

Laboratory Analytical Instruments are explained and pictured in this new 16-page booklet. It describes a line of infrared and ultraviolet spectrophotometers, monochromators, flame photometers, and vapor fractometers as well as accessories and instrument components available for use with them. The booklet also includes a brief description of Perkin-Elmer's process control instruments. **Write or call: Perkin-Elmer Corp., Norwalk, Conn., for laboratory analytical instruments catalog.**

●

How to Insulate a Cable. Using cartoons, new 28-page Bulletin 1106 explains the four most-used methods (strip process, extrusion, dip, and tape) employed by manufacturers for applying insulation to electrical conductors. It describes in easy-to-read nontechnical language the advantages and the disadvantages of each method. The booklet also contains useful information for choosing the right cable design for particular needs. **Write or call: Okonite Co., Passaic, N. J:, for Bulletin 1106.**

●

Mechanical Well-Logging Instrument is the subject of this new folder. According to the folder, the instrument is entirely mechanical and requires no electrical connections. It is a precision instrument constructed almost entirely of aluminum and steel, making it read-

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ily portable, yet rugged enough to withstand years of drilling operations and still provide consistently accurate records. It has been specifically designed to assure dependable operation under extreme climatic conditions. With a sample chart, the folder explains the large amount of valuable information on the drilling operations that can be gained from the well log. It also points out that the charts are made in duplicate and can be conveniently filed to provide a permanent duplicate record of the drilling operation. **Write or call: Geolograph Co., P. O. Box 1291, Oklahoma City 1, Okla., for folder on mechanical well logging.**

●

Wire-Line Specialty Tools for Permanent Well Completions and related well-servicing operations are the subject of this new 24-page descriptive and price catalog. It contains cutaway drawings, engineering data, parts and price lists, and recommended uses, as well as operation and maintenance procedures. **Write or call: Bowen-Itco, P. O. Box 4587, Houston 13, Tex., for wire-line specialty tools catalog.**

●

Stationary Generating Plant. Consisting of 32 pages, this bulletin describes the technical features and specifications of five types of Petbow engine-driven generating plants with outputs ranging from 3 to 160 kw. Drawings and tables supply dimensions, foundation layout plans, and approximate net weights of the units. Made in England, the plants are powered by four-stroke-cycle diesels. The generators are flange mounted to the engine. **Write or call: Petbow, Ltd., 20 A High Street, Canterbury, England, for Bulletin (Section E) on stationary generating plants.**

●

Indirect Heaters for Leases with input capacities ranging from 90,000 to 4,000,000 B.t.u. per hour are fully described in new 24-page technical Booklet Ih-4-57. Illustrating the heaters with cutaway photographs and drawings, the booklet gives detailed instructions on how to solve specific heating problems on the lease. The booklet also contains charts giving the engineering data necessary to the solution of these problems. The heaters may be selected with either single or split coils in sizes of 1 to 6 in. to handle nominal pressures up to 6,000 psi. **Write or call: Parkersburg Rig & Reel Co., 3345 Winthrop Avenue, Fort Worth 16, Tex., for Catalog Ih-4-57.**

●

Rotary Pumps and Hydraulic Pump-Motors. Punched for filing, new Cata-

log 957 describes and illustrates, with both diagrams and photographs, Roper rotary pumps with capacities ranging from ¾ to 375 g.p.m. and working pressures to 1,000 psi. Numerous tables and diagrams give sizes, capacities, and dimensions of the pumps. The catalog sets forth the pump's features and charts supply performance data. **Write or call: George D. Roper Corp., Rockford, Ill., for Catalog 957.**

•

Epoxy Resin Reinforced Line Pipe and Well Tubing. The product described in this four-page folder is a centrifugally cast thermosetting epoxy - resin - reinforced pipe with multiple layers of seamless braided glass-fiber sleeving. The folder tells how the pipe is made and prooftested. Clear photographs show how the pipe is made and the steps made in testing it. **Write or call: Fibercast Corp., P. O. Box 727, Sand Springs, Okla., for folder on Fibercast line pipe.**

•

How to Solve Pumping Problems. Divided into three sections, this new 36-page handbook tells how rotary gear pumps function, what they can do, and how to size and specify them. It includes sample problems covering hydraulic systems and general and pressure transfer. The technical-data section contains: (1) conversion tables, (2) electrical data for both a.c. and d.c. motors, (3) a chart of construction materials generally used for pumping various liquids, and (4) charts showing the friction loss through pipe in sizes from ½ through 6 in. at various viscosities and delivery rates. **Write or call: George D. Roper Corp., Rockford, Ill., for booklet, "How to Solve Pumping Problems."**

•

Plastic Pipe and Fittings. New Catalog A-1957 provides complete information on Telsco polyvinyl chloride pipe and fittings made from a high-impact resin for use in a variety of petroleum-industry applications, including salt water, sour crude, natural gas, refining, and water lines. The catalog covers two grades of the pipe with cold - water working-pressure ratings of 75 and 125 respectively. The catalog includes a chart comparing the properties of the PVC pipe with other types of thermoplastic pipe. It also lists complete physical properties for the PVC pipe and the common chemicals handled by it, and includes a handy chart for determining frictional losses. **Write or call: Telsco Fittings Div., 5422 Redfield Street, Dallas, Tex., for Catalog A-1957.**

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This Ampco centrifugal is being used as a charging pump handling treated water in a California oilfield.

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To protect you against pump failures under corrosive and erosive conditions, Ampco gives you protective features other standard pumps don't have. These Ampco extras include:

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EQUIPMENT MEN . . . in the News

Baker Announces Western Division Sales Changes

R. L. TURNER

Appointment of R. L. Turner as assistant manager, western division sales and service department, has been announced by Baker Oil Tools, Inc. H. L. Hanright, formerly subdistrict manager for Wyoming, replaces Turner in Denver as head of Rocky Mountain operations.

H. L. HANRIGHT

G. M. HAMILTON

G. M. Hamilton has been appointed branch manager of the company's sales and service operation in Coalinga where Aaron A. Baker will continue as plant production manager and northern California sales and service subdistrict manager.

Formerly district manager for the Rocky Mountain area, Turner has been with the company 22 years, serving as purchasing agent and manager of material control as well as in the sales and service department.

Edward Names Bachman as Denver Sales Engineer

Appointment of Roger O. Bachman as Denver area sales engineer for Rockwell-built Edward valves has been announced by W. F. Crawford, president of Edward Valves, Inc., East Chicago, Ind., subsidiary of Rockwell Manufacturing Co.

Since joining Edward Valves in 1955, Bachman has completed the regular 2-year training program which includes training and practical experience in the engineering, laboratory, production, assembly and service departments. He has also had field experience in the sales, installation and service of the entire Edward line of cast and forged-steel valves for steam generating stations, technological and process installations, industrial plants and Mudwonder valves for oil-drilling rigs.

W-K-M Appoints Shumate to Dallas-Fort Worth Post

The appointment of Charles R. Shumate as sales representative for W-K-M gate valves in the Dallas-Fort Worth district has been announced by B. J. Gross, vice president, marketing, for W-K-M, divison of ACF Industries, Inc.

Shumate who has been with W-K-M since 1951 was with the engineering department and recently has been in charge of special projects as a sales engineer.

Rolo Elects Boren Vice President-General Manager

W. M. BOREN

The appointment of W. M. (Bill) Boren as vice president and general manager of Rolo Manufacturing Co. of Houston has been announced by R. K. Franklin, Rolo president. Boren was elected to the new post at a recent meeting of Rolo directors.

Boren joined Rolo in 1949 as a trainee engineer and successively advanced to the positions of chief engineer, sales manager, director of engineering, and acting general manager.

Halliburton Appoints Gee As Venezuelan Manager

Roy Gee is now Venezuelan operations manager for Cia. Halliburton de Cementacion y Fomento, one of the South American subsidiaries of Halliburton Oil Well Cementing Co. Gee, with 25 years of service, has worked for Halliburton in the U. S., the Far East, Mexico, Chile and Venezuela. He will be stationed at Jusepin.

Cameron Names LeRouax and Oliver as Senior Engineers

The assignment of Robert K. LeRouax as senior engineer in charge of wellhead equipment department and John P. Oliver as senior engineer in charge of valve products department has been announced by R. C. Brooks, manager of commercial products engineering. Cameron Iron Works, Inc., Houston.

LeRouax has been with Cameron since 1952 in the research and patent engineering department. Before joining Cameron he was with Hinderliter Tool Co. and Oil Center Tool Co.

Oliver, who joined Cameron in 1948 in product engineering, was made senior engineer in charge of wellhead equipment department in 1956, a position he held until this new assignment.

Mission Sales Staff Holds Houston Conference

Members of the sales staff of Mission Manufacturing Co. who met recently in Houston for a regional sales conference are: (back row) Calvin Bell; Ken Woodard; Sonny Wyatt; Buddy Hebert; Bill Underwood; Shad Mims; Jack Faris; Tony Volotko; Joe Scalise; Byrom Wehner; Dudley Sharp, Jr.; Harold Herren; Harold Riley; A. E. Higginbotham, district manager, Baton Rouge; Gerald Seber. Seated: Jack Stewart, assistant sales manager; Anan Golub, vice president; W. B. Sharp, president and chairman of the board; Richard White, executive vice president and general manager; Ted Fullinwider, domestic sales manager; and Jack Bannister.

Dowell Opens Acidizing Station at Andrews, Tex.

Dowell Incorporated is operating out of its new Andrews station, according to E. F. Kelly, district manager. The station is used for acidizing service only. Installed on the five-acre site acquired recently by Dowell, there is a 15,000-gal. acid tank, loading rack and field office.

W. B. Hart has been transferred from Kermit to be station manager. Service engineers now working out of Andrews are R. D. Murphree and Rex Pensinger. L. E. (Tiny) Griffith, sales engineer, who has been in Andrews several years, will continue to make his headquarters there.

Elgen Corp. Promotes Four To District Manager Posts

L. C. HARPER

L. C. Harper has been promoted to district manager of new Elgen Corp. offices in Perryton, Tex., and Walker Paine to district manager at Tyler. Max L. Mitchell and John Yerger have been promoted to district managers of Elgen's newly opened offices in Seymour, Tex., and Shreveport, La.

WALKER PAINE

M. L. MITCHELL

Harper and Mitchell formerly were in the company's Wichita Falls office. Paine formerly was assistant district manager in Tyler. Yerger was district manager in Elgen's Tyler offices prior to his recent appointment.

Cardwell Organizes Canadian Subsidiary

Cardwell Manufacturing Co. of Wichita, Kans., has announced the formation of a Canadian subsidiary, Cardwell Manufacturing Co., Ltd., with head offices in the Lancaster Building, Calgary, Alta. The new company has taken over the Canadian sales of Cardwell drilling and servicing rigs and allied equipment.

The officers of Cardwell Manufacturing Co., Ltd., are Paul Courtney, president; Len Walker, vice president and general manager; J. T. Tucker, vice president; William A. Howard, secretary; Paul L. Doucet, treasurer and accountant. The company has engaged W. A. (Bun) Burggren as its machinery sales representative, headquartered in Edmonton. James L. McIlhargey has been appointed purchasing agent at Calgary.

The company has opened its first supply store at Weyburn, Sask., under the management of Stanley J. Grondin to service its customers in that area, and will be opening a second supply store at Edmonton in early July to service its customers in Alberta and northern British Columbia. These stores will carry a complete line of well-servicing and production supplies.

New Houston Firm to Manufacture Rectifiers

Recently incorporated under the name of Electronics International, Inc., this new Houston company will design, manufacture and market rectifiers for the protection of buried and submerged metal structures, it has been announced by Wayne A. Johnson, president.

Other executives of the new firm

OIL AND GAS MEN TELL US...

3 major reasons keep them coming back to Ryerson:

Flame-cut steel shapes save you money—one piece or hundreds—almost die-cut accuracy.

1. Biggest stocks—nobody comes even close to the size and variety of Ryerson inventories.

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STAINLESS—Allegheny Metal pipe • tubing • sheets plates • bars, etc.

ALLOY STEEL—including case hardening, direct hardening, heat treated and Rycut free-machining leaded alloys.

OTHER PRODUCTS—safety plate • grating • expanded metal • chain • wire rope • reinforcing bars plastic sheets • pipe & tubing • machinery & tools.

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In addition to giving an accurate signal on liquid level readings over long distances and doing it in the record time of 5 seconds, the "Varec" PULSE CODE Telemetering System can now perform a great variety of operations. Some idea of the system's flexibility can be obtained by checking these optional features:

1. Pulse Code Receivers with provisions for indicating liquid level, temperature, motor valve or other equipment status, abnormal or alarm conditions and other data as required.
2. Systems incorporating two or more receivers.
3. Systems incorporating two or more receivers and selectors.
4. Receiver with terminal provisions for connecting with data printer
5. Digital clock to be used in conjunction with data printer.
6. Serial entry data printer such as an electric typewriter
7. Parallel entry data printer such as a ribbon type adding machine.
8. Data Programmer to link Pulse Code receiver to data printer
9. Contactor units to provide "on — off" remote control of equipment such as pumps, motor-driven valves, etc.
10. Scanner unit to provide automatic scanning for data logging on a pre-determined time schedule.

With this wide selection of combinations, your "Varec" PULSE CODE System can be custom-built for your particular process..

Write for "Varec" Bulletin CP-3011 for full details of "Varec" PULSE CODE Telemetering.

961-20

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are: Ted Riseling, vice president in charge of sales; and J. H. Reynolds, vice president and secretary.

Manufacturing facilities are being set up at the location of a sister company, Corrosion Rectifying, Inc., of which Johnson is also the president.

Homco Names Four to Board of Directors

R. M. Freeman, general sales manager, W. L. Medders, chief engineer, A. J. Adams, Jr., personnel director,

R. M. FREEMAN

W. L. MEDDERS

and H. T. Hamm, comptroller, have been elected to the board of directors of Houston Oil Field Material Co., Inc., according to George O'Leary, president.

Freeman has been with Homco since

A. J. ADAMS

H. T. HAMM

1934, starting as a store manager in Freer, Tex. Successively, he was named assistant district manager in Southwest Texas, assistant district manager in West Texas and served in Victoria before being named resident manager in San Antonio. He went to Houston in 1955 as assistant sales manager and was appointed general sales manager in 1956.

Medders joined Homco in 1944, first working as a tool engineer. He was transferred to the product design department where he became senior project engineer in 1951. He was named assistant chief engineer in 1952 and chief engineer in 1953. Adams joined Homco in 1937 as a clerk in the fishing tool department and later was transferred to the sales department. He was named personnel director in 1947.

Hamm has been with Homco 18 years. He was chief cost accountant before being named comptroller earlier this year.

Burgess-Manning's Silencer Division Names Sales Mgr.

W. A. CARROLL

W. A. (Bill) Carroll, Jr. has been appointed general sales manager of the industrial silencer division of Burgess - Manning Co., according to S. G. Paddock, vice president. Also announced is the promotion of R. T. Oliver, Jr. of the New York office to district sales manager to replace Carroll. Oliver will be assisted by John R. Parsons, who recently joined Burgess-Manning in New York.

Carroll has been New York district manager for several years and has a broad experience in the field of silencing exhaust and intake noise from engines, compressors, blowers and pressure-reduction systems, and pulsation elimination in gas piping. He will headquarter in the Dallas office, assuming the sales responsibilities which were previously under the direction of Paddock.

Standard Tube Co. Will Produce Oil Well Tubing

Standard Tube Co. of Detroit is entering the oil-well-tubing manufacturing field. Upsetting, threading, testing equipment, and an additional electric resistance welding mill have been installed.

Standard Tube manufactures a complete line of electric-welded mechanical tubing, as well as heat exchanger and boiler tubing in the carbon steels, and mechanical and pressure tubing and pipe in the stainless steels.

Rhodes Promoted to BS&B Oil Field Equipment Post

E. A. RHODES

Edwin A. Rhodes has been promoted to the newly created position of technical service, low temperature separation, according to Floyd C. Myers, manager of sales and service, oil field equipment division of Black, Sivalls & Bryson, Inc. The new post, created to provide added facilities for broadening industry consultation on problems involving low temperature separation and stabilization, requires up-to-the minute knowledge of all development work,

They're Interchangeable
They're Simple
They're Quick

Put Economy and Flexibility in your Pipelines

Send for literature and prices. Distributor territories open.

STANDARD and LIGHTWEIGHT

ALUMIRON COUPLINGS

(Made in Aluminum or Malleable Iron)

For Grooved End Pipe

● Think back—remember the effort required to make and complete pipeline joints? Now you can do it an easier way with these two-bolt malleable iron Couplings. Pipeline progress dictated the design of Alumiron Couplings making them the simple, quick, positive, low cost way to join grooved-end steel, aluminum, cast and wrought iron and spiral pipe.

● Alumiron speedily joins grooved-end pipe by the mere tightening of two bolts which run through the coupling halves. The Buna N or oil resistant Neoprene gasket inside the coupling halves firmly and evenly grips the pipe ends making a leak-proof seal which increases as pipeline pressure mounts. This flexible Coupling permits the line to "come and go" with rough and uneven terrain. Component parts are interchangeable with other grooved-end couplings.

● Standard Series to 1,000 PSI working pressure in sizes 1" through 8". Lightweight Series to 500 PSI working pressure in sizes 2", 2½", 3", 4".

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PITTSBURGH 36, PA.

FOR all grades of petroleum, you will find Viking pumps the answer for POSITIVE delivery. They are noted for FAST priming and COMPLETE stripping qualities.

The 200 GPM Heavy Duty tank car loading pump shown here is at work in a southern petroleum refinery. With a Viking, you, too, can be sure of fast and positive movement of your products.

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product research and engineering in that field.

Rhodes joined BS&B in 1947 as a product engineer in the oil field equipment division, served as salesman at Snyder, Tex.; branch manager at Powell, Wyo.; and more recently as district engineer for the Casper, Wyo., district.

Oilwell Appoints Ruhl and Ahrens, Transfers Atkins

Appointment of Donald P. Ruhl as field representative at Casper, Wyo., for United States Steel Corp.'s Oil Well Supply Division and naming of John H. Ahrens as district engineer, machinery and equipment sales, have been announced by R. L. Armstrong, Rocky Mountain area manager of the division. Wayne B. Atkins, district representative, has been transferred from Fairfie'd, Ill., to Olney, Ill., according to C. H. Maynard, eastern area manager.

Ruhl was employed in 1955 at Fort Morgan, Colo., and was located there prior to his present appointment. Ahrens joined Oilwell in 1953 as an engineer trainee at Casper, Wyo. In 1954 he was appointed field representative at Casper and later in the same year was named assistant district engineer, machinery and equipment sales at this location. Atkins worked in various sales and managerial positions from 1936 to 1942. He later served as field representative at Odessa, Tex., and store manager at McCamey, Big Spring, and Snyder, Tex.; field representative at Snyder, Odessa, and Hobbs, N. M. In 1955 he was named district representative at Fairfield, where he served prior to his present appointment.

Martin-Decker Appoints Herrick, Promotes Boydston

The appointment of A. G. Herrick as industrial sales manager has been announced by E. L. Decker, president of Martin-Decker Corp., Long Beach, Calif. Herrick will direct the sale of heavy-duty weight and tension-indicating instruments. The company is known for the oil-well drilling-control instruments it has manufactured for over 30 years.

Former Sales Manager Roy L. Boydston, with Martin-Decker 14 years, has been promoted to product engineer with responsibility for new product development.

Prior to this appointment, Herrick was sales representative for Trailmobile Co. in Cincinnati, Ohio.

Plastic Applicators, Inc. Names Odessa Plant Supt.

Vernon Halverson, formerly general foreman of the Houston plant of Plastic Applicators, Inc., has been appointed superintendent of the company's new Odessa location.

The new Odessa plant is expected to improve freight rates and delivery schedules for many users of baked-on plastic-coated products.

Fluor's Metal Fabrication Division Names Kratzberg

A. R. Kratzberg has been named manager of Fluor Products Co.'s metal fabrication division at Paola, Kans., according to J. P. Wiseman, president.

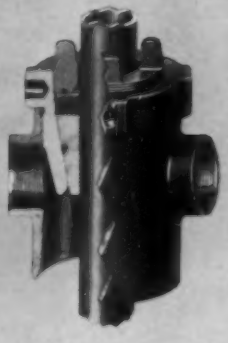
Kratzberg, who started with Fluor in 1935 as a welder on construction jobs, succeeds Clyde W. Hull, who has headed the metal manufacturing activity since 1953. Hull recently resigned.

Kratzberg came to the Paola installation from construction in 1940 as assistant superintendent. In 1954 he was promoted to general superintendent.

HEAD OF THEIR CLASS

FIG. 91

Simplicity and compactness, for ease of installation and neatness of hookup, are incorporated into the Larkin Casing Head (2000 psi test, 1000 psi working pressure.) It is designed to provide a safe and economical means of suspending and packing off casing strings. This head has been tested to support 225,000 lbs., equivalent to 5600' of 7", 20-lb. casing with a safety factor of 2.



TYPE L

A new member of the Larkin Well Head line, the Type L Tubing Head fills a need in low pressure areas where economy may be effected with complete safety. It is forged steel construction, full opening, 2000 lb. psi, top of body threaded 7" API to accommodate control equipment, hinged three-segment slips, 2" or 3" side outlets.

For detailed information on these and other Larkin Tubing and Casing Heads, please refer to your Larkin Catalog or talk to your Larkin Representative. All Larkin Equipment is available through your supply store.

LARKIN LEADERSHIP HAS BEEN EARNED

Bailey Appoints Manager Chemical, Petroleum Sales

Frank H. Fellows, sales engineer, Bailey Meter Co., has been named manager of the company's chemical and petroleum sales division. Bailey, whose headquarters are in Cleveland, manufactures industrial instruments and automatic controls for the power and process industries.

Fellows joined the company in 1929 and has been in the sales department since 1930.

Hallett Engines to Be Distributed by Waukesha

A new series of low-cost, lightweight, diesel engines has been added to its distribution list by Waukesha Sales & Service, Inc., Houston. The new units are the Hallett engines which are now being manufactured by American M.A.R.C., Inc. The latter company recently purchased the diesel engine division of Hallett Manufacturing Co.

Hallett engines are available in air or water-cooled models from 5.5 to 25 hp. These are available as portable power units, generating plants, pumping units, or for marine propulsion.

Waukesha Sales & Service, Inc., has 13 sales and service installations in Texas, Louisiana, and New Mexico.

Jameson Named Manager of Bucyrus-Erie's Drill Division

Henry M. Jameson has been appointed general manager of the drill division of Bucyrus-Erie Co., South Milwaukee, Wis. The company is building a new plant which will be completed in early 1958 and will provide 300,000 sq. ft. of floor space for the manufacture of Bucyrus-Erie's complete line of oil-well spudders and water-well and blast-hole drills.

The company will open a headquarters office for the drill division in Richmond, Ind., in the near future.

Jameson served with Insley Manufacturing Co. and Allis-Chalmers Manufacturing Co. prior to joining Bucyrus-Erie in 1937 as tractor equipment sales manager.

Anchor's Asphalt-Refined Products Promotes Three

R. D. RAYBORN

ED. S. SMITH

W. J. STIEGER

Robert D. Rayborn has been promoted to general manager of the asphalt and refined products division, Anchor Petroleum Co., Tulsa, according to W. A. Baden, president. Ed S. Smith has been promoted to assistant manager of the division and is being transferred from the Omaha office to Tulsa.

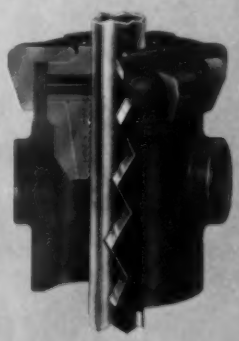
William J. Stieger has been promoted to sales manager, Midwest district, with headquarters in St. Paul.

Rayborn was formerly in the refinery sales department of Anchor's Des Moines office.

for medium pressure wells

TYPE R

The Larkin Type R. Tubing Head is a conversion from the Type SR Head. This ease of conversion makes it possible to use the same stripper adapter and Neoprene stripper when working on any well equipped with a Larkin Tubing Head.



TYPE SR

The Larkin Type SR Tubing Head is a slip suspension head, equipped with a Neoprene Stripper which serves as a blow-out preventer and oil saver while tubing is being pulled or run. It is very suitable where higher pressures might be encountered.

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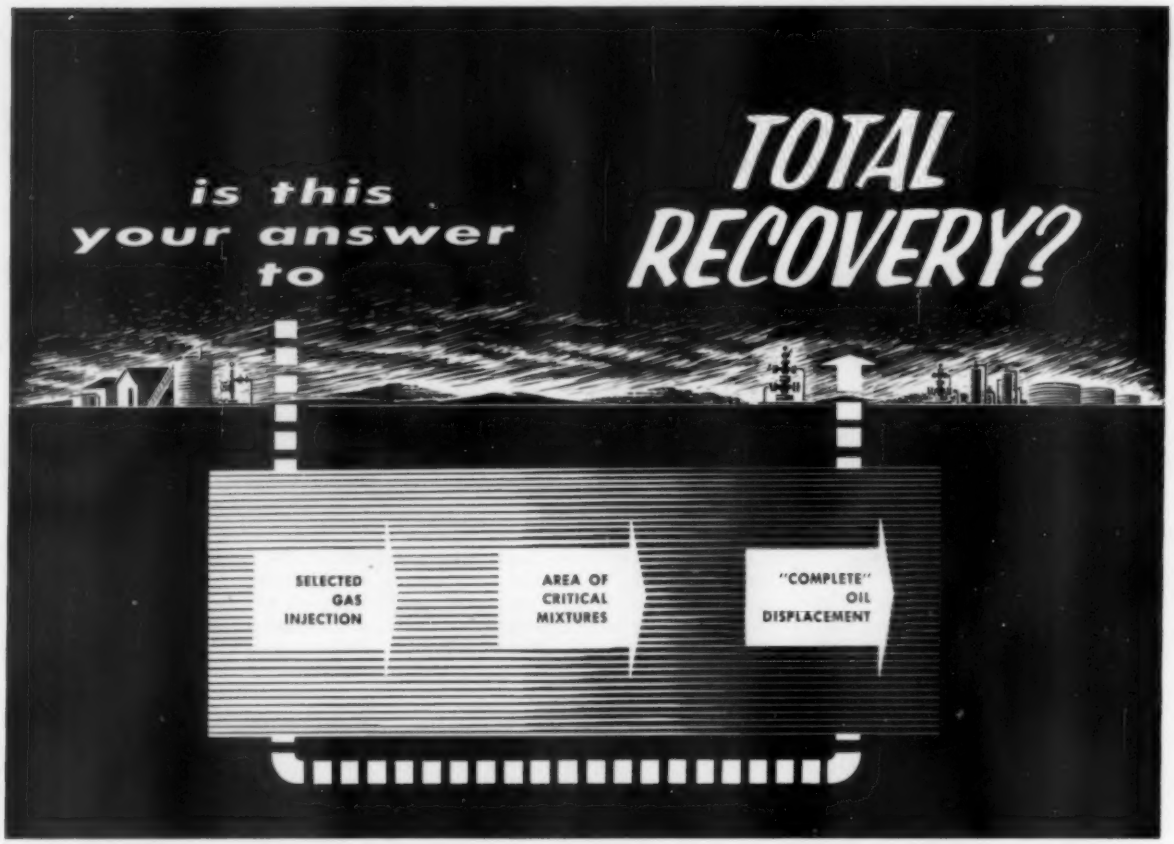
BY YEARS OF DEPENDABLE PERFORMANCE



"The condensing gas drive (critical displacement) process now offers a method whereby total recovery of oil can be obtained in parts of a reservoir whether the reservoir is in its primary, secondary, or even third and last phase of operations."

Considered by many as *"the most promising idea since waterflooding"* this major-company developed technique could conceivably double recoverable oil reserves.

Can it be applied to your recovery problems? Core Lab's Engineering and Consulting Department is currently engaged in investigating the feasibility of applying a condensing gas drive (critical displacement) process to a number of reservoirs. This work is being supplemented by the services of Core Lab's Reservoir Fluid Analysis Division, Special Core Analysis Studies Group, and the use of "capsule reservoir" equipment recently installed for this purpose by Research and Development.

Obtaining the answers to a number of basic questions regarding a specific reservoir and its present operations is your practical approach to the problem. Simply write Core Lab, Dept. SD, Box 10185, Dallas. Give a brief description of the reservoir. Competent engineering personnel will process your inquiry.

Will the revolutionary Condensing Gas Drive (Critical Displacement) Process work in your reservoir? Write Core Lab, Dept. SD, Box 10185, Dallas. Include a brief description of the reservoir. (Please mention this publication.)

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Let's Take Another Look at the "Obvious"

by Frank J. Gardner

IN speech after speech, you hear it said that from now on, the oil hunter must dig deep into his imagination if he is to find new untapped pools . . . that all of the "obvious" structures in this country have been drilled.

Have they? Take a look at a structure map of almost any state. You can probably put your finger on at least a dozen undrilled surface structures that look like oil targets. In the Rockies, you can probably spot a hundred or more to the state. Even in Texas, and California, you can find these prospects. Subsurface structure maps are just as fruitful.

"Oh," you say, "but that one **has** been drilled. There's an old dry hole right there!"

An old dry hole! How many potentially productive structures in this nation have been forever condemned by a dry hole? And how many holes must be sunk before we can say a structure has been "drilled?" These are questions that hold the key to much undiscovered oil. Who drilled that old dry hole? When? How? To what depth? You cannot condemn a structure on the strength of a dry hole, or two, or three, or four.

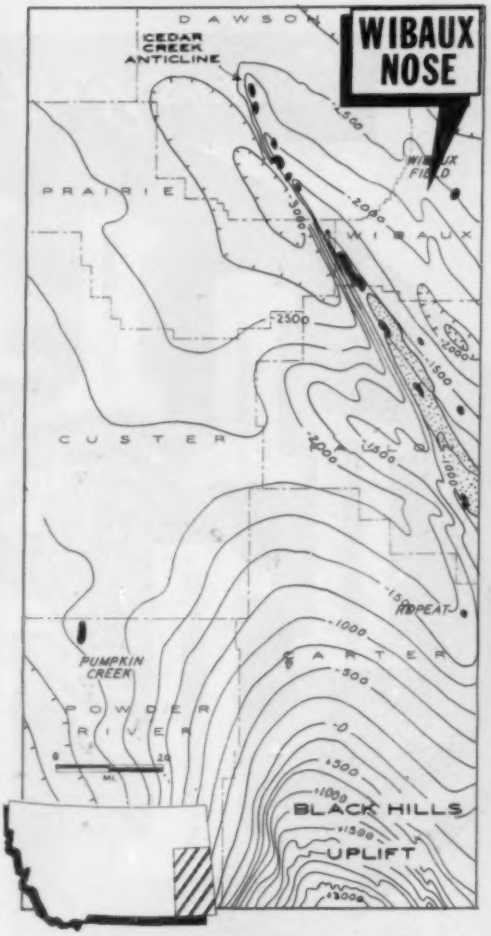
Obviously . . . And what do we mean by obvious? There are many subtle nuances of surface structure that may escape the casual observer. To a trained eye, they may be obvious. If we add these to the ones that practically jump out from the map, the possibilities become almost infinite.

In addition to the obvious and the subtle, there are the traps that are totally hidden, and these are the ones that demand the most imagination and the best geophysics. They include the elusive stratigraphic traps; there is nothing "obvious" about them, and, ironically, they have produced our greatest oil fields—East Texas, Pembina, Scurry-Snyder, and many others. It is reasonable to ssume that with the great amount of drilling that will take place in the next decade (now estimated at 735,000 wells), more of these "accidents" will happen, especially in view of our slowly developing knowledge of strat traps and how they grew.

Accidents will happen . . . But we cannot depend upon these accidents. We must exploit to the fullest the thousands of obvious surface structures, "drilled" or undrilled. To meet the growing demands for oil in the next 25 years, every surface structure in this country, productive or nonproductive, must be reexamined and redrilled in the light of modern methods and knowledge. Any speaker who says all the obvious structures have been drilled is simply not observant.

One example: take a look at this map. This is the southeast corner of Montana, where the great Cedar Creek anticline has been known and mapped since 1910. It's an obvious structure. In 1913 the first Cretaceous gas well was completed and shut in; in 1915, the first markets were developed and more than 400 gassers were drilled. Between 1923 and 1950, only six deep tests were drilled; of these, four had good or subcommercial oil shows in pre-Cretaceous rocks. Not until 1952 was deep production firmly set; today, the anticline has 15 fine oil fields producing from Mississippian, Silurian, and Ordiovician rocks below 7,800 ft.

Now look east. You'll see the Wibaux nose, a plunging anticlinal nose some 30 to 40 miles long, and nearly parallel to the Montana-North Dakota border. Here is a long-mapped structure which to the observant should be obvious. Its chances for commercial oil pools should be well above average. But not a single well has pierced its crest. On its eastern flank, the one-well Wibaux pool was discovered by Lion Oil Co. 1 Knight (Section 29-14n-60e) in 1954; here, oil was found in the Red River-Ordovician at 10,910 ft. and no further development has occurred. The discovery is still producing about 25 bbl. daily.



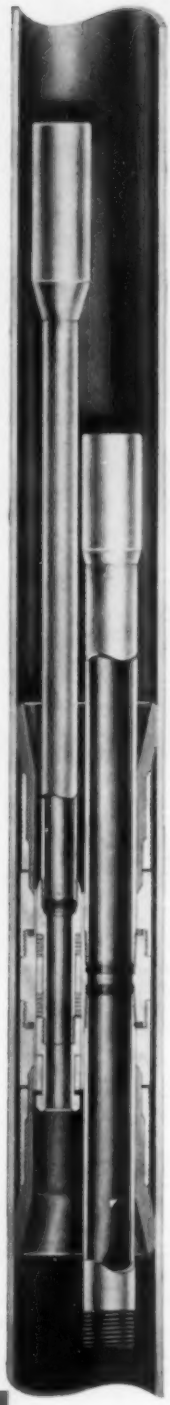
PER ACRE RECOVERIES estimated for fields along Montana's Cedar Creek anticline range from a low of 762 bbl. at East Little Beaver to 13,500 bbl. at Cabin Creek. The unexplored Wibaux nose may produce similar fields in the future.

On lands now up for sale . . . Lands along the Wibaux nose are now up for sale; several tracts astride this hot "sleeper" are included in a state lease auction to be held in Helena on May 13. The bidding should be brisk, for operators believe that new pools await discovery along this structure at depths comparable to those on the Cedar Creek anticline. Some companies are unhappy about production performance of fields in this region, but the recovery per acre estimated for most of the Cedar Creek fields belies any pessimism about them.

This is just one example of the things we're overlooking in this country. Bringing them to the attention of the industry is the job of the observant geologist; that has finally happened at Wibaux. And it will happen in many another place. That's obvious.

Always first

With the Best in Completion and Production Tools



For twenty-five years Brown Oil Tools has produced the completion and production equipment the petroleum industry needs. As new needs arise Brown research is with, or ahead of, the industry in development and testing of the equipment that will do the job and do it right.

The tools shown above – The Duo-Pak Packer – The Bridging Plug Packer – The RS 1B – The Dual String Packer – The SOS J-7 – The Casing Patch Tool – The Mechanical Set Packer – The Boll Weevil Liner Hanger – The Zone Selector – are representative of the Brown line of tools. Each tool was developed to meet a particular need for the industry.

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Where Does Oklahoma Get Her Oil?

● This is the second in a series of reviews of the principal oil pays in southwestern states.

by Frank E. McGonagill, Jr.

THE booklet entitled "Oil Production History of the Southwest," prepared by the oil and gas department of the Bank of the Southwest, presents statistical information on important oil-producing formations in seven southwestern states. Its basic data were obtained from "Statistics of Oil and Gas Development and Production," Vol. 9, published by the American Institute of Mining and Metallurgical Engineers—Petroleum Branch. Additional data were obtained from Yearbook 1955 of the National Oil Scouts and Landmen's Association.

The Oklahoma section of the booklet contains data on 22 formations. It covers a total of 459 fields with a cumulative production through 1954 of 248,562,671 bbl. At the end of 1954, average cumulative field production for the formations presented was 462,412 bbl.; average cumulative recovery per acre was 1,434 bbl.; with an average cumulative acre-foot recovery of 85 bbl.

Total production . . . The 1954 total production from these fields was 21,488,700 bbl. or approximately 12 per cent of the total state production for that year. During the same period, the average field production was 46,816 bbl.

Author Frank E. McGonagill, Jr., is a petroleum engineer in the oil and gas department of the Bank of the Southwest, and is also a vice president of the bank.

The earliest production in Oklahoma from formations covered in this summary was established in Casey field of Pawnee County, which has been producing from the Pennsylvanian Prue formation since 1917.

The most prolific formation from the standpoint of cumulative production is the Wilcox formation of Ordovician age, which has produced 59,338,758 bbl. through 1954. In addition, the Deese Pennsylvanian formation had the greatest average field cumulative production at the end of 1954, averaging 1,443,721 bbl. per field. The Deese per acre and per acre-foot recoveries through 1954 were 1,156 and 57 bbl., respectively.

The Wilcox (Ordovician) formation of Oklahoma boasted 71 fields, which was the greatest number of fields. These fields had an average cumulative field production through 1954 or 835,757 bbl.

The Wilcox formation of Ordovician age leads Oklahoma in recoveries per acre and per acre-foot. Average cumulative production in these categories through 1954 from this formation was 6,024 bbl. per acre and 211 bbl. per acre-foot.

Total production during 1954 was also led by the Wilcox formation with a total production for the year of 3,711,920 bbl. The per field production during 1954 was led by the Calvin Pennsylvanian formation with a total of 173,079 bbl.

Comparison . . . It is not possible to compare the productive area or number of wells for the various formations since complete information was not available. The average cumulative recoveries per acre and per acre-foot shown were calculated only from those fields with sufficient information to do so.

Two tables are included with this summary. Table 1 presents the relative importance of the various formations with respect to order of discovery, number of fields, production to the end of 1954, production during 1954, and cumulative production through 1954 of barrels per acre, barrels per acre-foot, and average recovery per field. Table 2 contains the totals and averages of the various formations from the booklet, "Oil Production History of the Southwest."

TABLE 1—RELATIVE IMPORTANCE OF PRINCIPAL OKLAHOMA PRODUCING FORMATIONS

					Through 1954		
Rank	Order of discovery	Number of fields	Production to end of 1954	Production during 1954	Cum. recovery per acre, bbl.	Cum. recovery per acre-ft., bbl.	Avg. cum. recovery per field, bbl.
1	Prue	Wilcox	Wilcox	Wilcox	Wilcox	Wilcox	Deese
2	Bartlesville	Skinner	Simpson	Red Fork	Cromwell	Simpson	Simpson
3	Wilcox	Bartlesville	Deese	Skinner	Simpson	Senora	Wilcox
4	Booch	Simpson	Bartlesville	Bartlesville	Earlsboro	Cromwell	Earlsboro
5	Cleveland	Red Fork	Cromwell	Simpson	Misener	Bartlesville	Cromwell
6	Misener	Cromwell	Red Fork	Bromide	Booch	Misener	Booch
7	Simpson	Cleveland	Earlsboro	Calvin	Senora	Skinner	Calvin
8	Earlsboro	Prue	Skinner	Prue	Hoxbar	Earlsboro	Bartlesville
9	Granite wash	Deese	Layton	Deese	Springer	Red Fork	Granite wash
10	Layton	Layton	Prue	Layton	Bartlesville	Hoxbar	Misener
11	Skinner	Bromide	Cleveland	Cleveland	Bromide	Layton	Red Fork
12	Cromwell	Misener	Bromide	Granite wash	Deese	Mississippi chat	Layton
13	Red Fork	Earlsboro	Misener	Earlsboro	Mississippi chat	Gilcrease	Springer
14	Senora	Dutcher	Booch	Cromwell	Layton	Booch	Senora
15	Gilcrease	Granite wash	Granite wash	Springer	Skinner	Calvin	Bromide
16	Springer	Senora	Calvin	Misener	Red Fork	Deese	Hoxbar
17	Bromide	Booch	Senora	Booch	Granite wash	Bromide	Prue
18	Deese	Gilcrease	Springer	Hoxbar	Calvin	Prue	Cleveland
19	Hoxbar	Mississippi chat	Hoxbar	Senora	Prue	Springer	Skinner
20	Calvin	Springer	Mississippi chat	Mississippi chat	Gilcrease	Granite wash	Mississippi chat
21	Mississippi chat	Calvin	Gilcrease	Gilcrease	Cleveland	Cleveland	Gilcrease
22	Dutcher	Hoxbar	Dutcher	Dutcher	Dutcher	Dutcher	Dutcher

(See Table 2 on pages 180 and 181)

Where Does Oklahoma Get Her Oil—Article starts on page 179

EXPLORATION

APPALACHIAN

WEST VIRGINIA

In Portland district, Preston County, West Virginia, Hope Natural Gas Co. 10015 Sarah J. Creamer, deep test, elevation 2,356 ft., was dry. Tully 5,206-35 ft., chert 5,901 ft., Oriskany sand 6,084 ft., gas shows 6,192-94 ft., salt water 6,195 ft. Total depth 6,197 ft.

● Glade district, Webster County, Columbian Carbon Co. has made another wildcat location, 3,1267 The Gauley Co., elevation 2,700 ft., Webster Springs Quadrang'e, 1.52 miles south of latitude 38 degrees 25 minutes and 0.97 mile west of longitude 80 degrees 25 minutes.

PENNSYLVANIA

In Young Township, Indiana County, Southwest Pennsylvania, Manufacturers Light & Heat Co. 4-4427 R. & P. Coal Co., wildcat, was successful but not of large volume. It had a final test of 154,000 cu. ft. gas after fracture and a rock pressure of 3,650 psi. in 5 days. The chert was at 7,473 ft., gas at 7,540 ft. and 7,710 ft., Oriskany sand 7,794-7,710 ft., Oriskany sand 7,794-7,808 ft. Total depth 7,824 ft.

OHIO

Two gassers extending the Canal Fulton field north and west in Chippewa Township, Wayne County, were completed by East Ohio Gas Co. The 1 Jack Scott in Section 25 logged the Clinton at 3,714-53 ft., with 258,000 cu. ft. natural and 4,026,000 cu. ft. 24 hours after fracture. The 1 R. F. Geiser in Section 35 logged the Clinton at 3,840-80 ft. with 28,000 cu. ft. natural and 952,000 cu. ft. 24 hours after fracture.

● An eastward extension to the Gratiot pool was completed by Robison et al-W. Higginbottom 1, 3 Qr., Hopewell Township, Muskingum County. The Clinton was found at 3,135-3,202 ft. with show of gas and oil natural. Well made 25 bbl. of oil first 24 hours after fracture.

● An offset by Natol-A. M. O'Donlell 1, Section 21, Hopewell Township, Licking County, in the same pool, found the Clinton at 3,120-57 ft. with show of gas and oil natural. Well made 197,000 cu. ft. gas and 145 bbl. oil 24 hours after fracture.

EASTERN KENTUCKY

Kentucky West Virginia Gas Co. has completed a good well in Big Sandy gas field at its 6363 Henry T. Addington. Located on Brushy Fork of Beefhide Creek in Pike County, well flowed naturally at the rate of 5,693,000 cu. ft. of gas daily from Mississippian Big Lime 2,485 to 2,498 ft. Top of formation was logged at 2,180 ft. and penetrated to 2,520 ft. total depth. A rock pressure of 335 psi. was recorded in 48 hours.

Table 2—Principal

Formation—	Year of discovery		No. of fields	Area proved acres
Bartlesville (Pennsylvanian)	1920	Totals	39	6,320
		Averages		
Booch (Pennsylvanian)	1926	Totals	9	3,060
		Averages		
Bromide (Ordovician)	1945	Totals	19	3,440
		Averages		
Calvin (Pennsylvanian)	1946	Totals	7	3,560
		Averages		
Cleveland (Pennsylvanian)	1927	Totals	25	2,630
		Averages		
Cromwell (Pennsylvanian)	1936	Totals	27	5,500
		Averages		
Deese (Pennsylvanian)	1945	Totals	24	14,100
		Averages		
Dutcher (Pennsylvanian)	1948	Totals	11	420
		Averages		
Earlsboro (Pennsylvanian)	1934	Totals	11	2,860
		Averages		
Gilcrease (Pennsylvanian)	1940	Totals	8	790
		Averages		
Granite wash (Pennsylvanian)	1934	Totals	10	2,090
		Averages		
Hoxbar (Pennsylvanian)	1945	Totals	7	1,290
		Averages		
Layton (Pennsylvanian)	1934	Totals	23	5,880
		Averages		
Misener (Mississippian)	1929	Totals	14	1,920
		Averages		
Mississippi chat (Mississippian)	1947	Totals	8	610
		Averages		
Prue (Pennsylvanian)	1917	Totals	25	8,540
		Averages		
Red Fork (Pennsylvanian)	1936	Totals	30	7,306
		Averages		
Senora (Pennsylvanian)	1937	Totals	10	1,330
		Averages		
Simpson (Ordovician)	1930	Totals	30	4,140
		Averages		
Skinner (Pennsylvanian)	1935	Totals	43	8,850
		Averages		
Springer (Pennsylvanian)	1942	Totals	8	2,450
		Averages		
Wilcox (Ordovician)	1923	Totals	71	12,260
		Averages		
Total all formations			459	99,346
Averages all formations				

Exploration This Week

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Successful Wildcats	196

Oklahoma Producing Formations

Production to end of 1954	Production during 1954	Wells producing Dec. 1954	Gravity, °A.P.I.	Avg. net productive thickness, ft.	Acre-ft.	Through 1954 Cumulative recovery per acre, bbl.	Through 1954 Cumulative recovery per acre-ft., bbl.	Through 1954 Recovery average per field, bbl.
18,245,838	2,052,324	426	40	17	84,190	1,446	132	467,842
4,938,468	304,025	194	35	20	82,470	1,688	66	548,718
5,628,012	1,226,495	93	41	31	120,680	1,398	49	296,211
3,823,122	1,214,056	295	37	13	65,470	761	62	546,160
5,693,170	746,425	207	41	15	41,750	442	26	227,726
16,824,884	472,820	238	60	18	126,010	2,055	144	623,143
34,649,307	909,845	391	36	26	429,550	1,156	57	1,443,721
133,563	69,675	24	37	17	5,440	305	18	12,142
8,628,441	506,997	145	36	19	66,440	1,968	86	784,403
623,283	117,899	53	33	13	11,890	677	67	77,910
4,324,009	582,507	220	39	19	48,100	776	33	432,400
1,983,573	274,642	55	41	23	25,860	1,469	74	283,360
7,770,534	772,638	190	40	15	51,010	1,076	72	337,849
5,300,237	304,870	50	42	11	19,450	1,703	123	378,588
1,094,520	153,186	35	40	27	13,510	1,150	70	136,810
6,223,053	1,095,061	299	42	20	309,250	738	42	248,922
11,146,943	2,370,411	478	38	14	86,428	787	81	371,564
3,274,777	266,198	92	32	18	15,450	1,555	151	327,477
38,246,085	1,714,480	261	40	17	69,770	2,014	153	1,274,869
8,025,188	2,273,817	359	41	12	127,100	858	113	186,632
2,646,906	348,427	89	35	33	76,360	1,462	39	330,863
59,338,758	3,711,902	517	40	11	121,065	6,024	211	835,757
248,562,671	21,488,700	4,711	39	19	1,997,243	1,434	85	462,412

CALIFORNIA

Union Scores Again At Mountain View

Union Oil Co. of California completed 77-27 UOC-Hancock-Houchin-Guimarra in SE SE 27-31s-29e for a new pool discovery in the Arvin area, Mountain View field, Kern County. The find is about ½-mile southwest of main Arvin area production and nearly 2 miles southeast of Union's recently discovered Stenderup pool activity. The new discovery was completed flowing 164-bbl. daily of 35.1°-gravity crude from an interval at 8,224 ft. The well was plugged back to 8,230 ft. from total depth of 9,325 ft. for the completion.

Mt. Poso Discovery

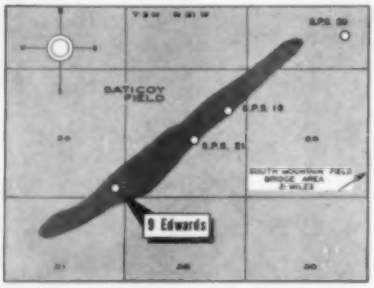
Bishop and Dolley, operators, found a new Vedder sand pool on the east flank of the Dorsey area of Mt. Poso field, Kern County. The operators completed 2 "Mon" for 25 bbl. daily of 15°-gravity crude, 12 per cent cut from a shallow zone at 1,372 ft. Total depth of the well, located in SE NE 26-27s-28e, is 1,393 ft.

Richfield Nearing Two Wheeler Ridge Finds

Richfield Oil Corp. was preparing to complete a wildcat in SE SE 26-11n-20w on the east flank of the Wheeler Ridge field, Kern County, for what looks like either an extension of the

Windgap pool or a new pool discovery. This wildcat, 88-26 Mitchell, is almost ¾ of a mile northwest of the Windgap pool discovery well. Richfield has set 5½-in. liner to 9,039 ft., including perforations between 8,957-9,039 ft. The producing formation the operator is aiming for is in the Zamarrian sand.

About 1¼ miles northeast of 88-26 Mitchell, Richfield was setting 7-in. casing in a 9,710-ft. wildcat. This test is about 4,000 ft. northwest of Richfield's Wheeler Ridge Community new pool discovery made in February.



Shell Oil Co. has four rigs busy in Saticoy field, Ventura County, and another location waiting on contractor.

Shell Steps Up Saticoy Drilling

Shell Oil Co. was stepping up drilling in Saticoy field, Ventura County, with four rigs active and another location waiting on the contractor.

The most closely watched rig was drilling ahead below 3,680 ft. on 20 S.P.S. (see map) in NW SE 21-3n-21w. This is the most northerly test in the field and is only about 2 miles southwest of the prolific Bridge area, South Mountain field. Shell's other active rigs were working in 29 and 30-3n-21w.

This field, which is the exclusive property of Shell thus far, presents an oil-field oddity. The steeply dipping Pliocene beds make contact with the Oakridge fault to the northwest forming a long, narrow pool apparently only one or two locations wide at the most. There are a number of producing sands, some of which Shell is producing separately and others jointly. However, because of the discontinuity anomalies and the interconnection of the various sands, the field is classified as one pool.

Shell now has 26 wells producing nearly 6,000 bbl. daily from the field.

CANADA

QUEBEC

At Bald Mountain 1 Batiscan, in further testing operations, and while producing through a 3-in. open valve, the well maintained a flowing pressure of 920 psi.

At Bald Mountain 2 Batiscan, a gas showing was obtained at 450 ft. and at 532 ft. a flow of gas, visually estimated at 200,000 cu. ft., was encountered. The well is now drilling below 615 ft.

At Bald Mountain 1 Berthier a gas showing was obtained at 1,673 ft., which tested 24,700 cu. ft., and the well is now drilling below 1,780 ft.

At Bald Mountain 2 Portneuf drilling has started, and is presently going through the overburden.

At Bald Mountain 1 Cap Sante drilling is down to 350 ft.

ALBERTA

Phillips Hits at Slave Point Wildcat

Phillips Petroleum Co. has discovered oil in the Middle Devonian-Slave Point formation at a well 35 miles west and 6 miles south of the Home-Union-H. B. 9-20 Virginia Hills strike which indicated crude oil production from the same formation a short time ago. It is not known and will not be for some time, until further drilling in the area between the two holes has been carried out, if there is any tie-in between them. If there is and if the other Home discovery well, 8-11 Swan Hills, drilled 25 miles northeast of the Virginia Hills strike is also tied in a major field area larger than Pembina may have been uncovered. That assumption, however, is very premature and only further evaluation drilling between the three wellsites will prove or disprove the theory.

The newest of the three strikes, Phillips 1 Kaybob, is being drilled on LSD 7, 22-64-19w5, 90 miles southeast of Grande Prairie townsite and 140 miles west-northwest of Edmonton city limits. Drill-stem test in the Slave Point horizon, sprayed oil to the surface in 40 minutes at an estimated rate of 10 bbl. per hour. Along with the oil spray a gas flow rate of 5,000,000 cu. ft. daily was encountered. Final pipe recovery showed 2,070 ft. of 42°-gravity oil and 5 ft. of oily gas-cut mud, no water. That drill-stem test evaluation was of a 26-ft. interval below 9,574 ft. and since that, crew of the drilling contracted rig employed on the hole had another core and is preparing to run a further drill-stem test evaluation at the present time.

Phillips is drilling this hole on a 92,160-acre Petroleum and Natural Gas Reservation block acquired under a farmout agreement from the California Standard Co. and the British American Oil Co. In order to earn its interest in the well and acreage the firm is commited to drill a 12,000-ft. D2 zone of Devonian test.

More Gas Found In Southwest Area

Another gas strike in the general Pincher Creek-Savanna Creek-Waterton Park area of southwestern Alberta was reported this week by Texaco Exploration Co. indicating this area is fast becoming one of the hottest gas plays in western Canada. All of the major finds in that sector of Alberta, bordering on the Rocky Mountains, have been obtained from the Mississippian formation and this recent find is not unlike the others. Shell Oil Co.'s 1 Waterton well, 10½ miles southeast of the new find was the last discovery to be reported and that well, during production test operations gave up 9,750,000 cu. ft. of gas daily along with a fluid recovery of 20 bbl. of condensate per million cubic feet.

Texaco A3-4 Castle River, on LSD 3, 4-6-2w5, the new strike, lies 18 miles northwest of the present limits of Pincher Creek gas field, 110 miles south-southwest of Calgary.

Drill-stem test in the Mississippian run below 11,050 ft. gave a gas flow rate of 2,500,000 cu. ft. daily and a pipe recovery of 270 ft. of gas-cut mud.

The well is being drilled by Texaco on a block of 11,396 acres obtained from the Alberta Government on May 17, 1956, under Drilling Reservation form for a cash bonus of $68,288.

BRITISH COLUMBIA

New Pool and Zone Oil Strike Reported at Red Creek

A new pool and zone oil discovery was reported by Pacific Petroleums, Ltd., at its gas development driller in the Red Creek-Fort St. John area of northeastern British Columbia. The drill-stem test in the Triassic "B" formation, which has previously proved nonproductive although some staining and oil bleeding on cores from other wells in the area had been apparent, gave up 330 ft. of mud and light gravity oil (75 per cent crude). Because the zone is dolomitic it is felt that through acidization in future production tests the well has a good chance of success.

Pacific 88 Red Creek is being drilled on LSD 10, 22-85-21w6, primarily a Triassic "D" zone gas area, northwest of gas production in main development sector of the Fort St. John gas field. The closest previous gas success, Pacific 36 Red Creek, lies 1 mile north-

west while the Pacific 36 Red Creek gas well is 2 miles south-southwest.

The well is being drilled by Pacific on wholly owned acreage which is subject to an 8¼ per cent carried interest to H. L. Straight, a private individual and 1¾ per cent to Canso Oil Producers Ltd. However, a previous agreement with Imperial Oil, Ltd., states that Imperial has a right to participate in any oil discovered by Pacific on certain lands in British Columba. This well falls under that agreement but it is not known if Imperial will exercise that option.

ILLINOIS BASIN

INDIANA

New Waltersburgh Area Develops in Vanderburgh

A new Waltersburg sand oil field is developing just 4 miles northwest of the city of Evansville in Vanderburgh County. The discovery well, Stouder Drilling Co.-Sinclair Oil & Gas Co. 1 Herschelman, SE SE SW 7-6s-11w, made 184 bbl. of oil per day from the Waltersburg at 1,826-49 ft. and Tar Springs at 1,964-73 ft.

Another well, the 1 Schmitz, west offset, is testing at 1,817-53 ft. Sun Oil Co. completed 1 Mueller, SW SW SE 7-6s-11w, for 55 bbl. per day from the Waltersburg at 1,822-34 ft.

LOUISIANA

NORTH LOUISIANA

Gas-Distillate Discovery Reported in Caddo Parish

Caddo Parish recorded a Paluxy gas-distillate discovery. The strike is Roger Bassett and Ralph Akin 1 Alton Keoun et al in NE NW 9-22n-14w, 7½ miles west of Plain Dealing.

The wildcat flowed as estimated 3,300 M.c.f. of gas per day plus 25-30 bbl. of distillate or oil per million on ⅜-in. choke. Perforations are at 2,833-37 ft. This well is 4¼ miles southeast of Mira in the northeastern part of Caddo Parish, northwestern Louisiana. Follow-up tests are expected soon.

Sabine Completes Kingston Gas Discovery in DeSoto

A gas discovery in DeSoto Parish flowed 5,400 M.c.f. of gas per day, absolute open flow, from perforations at 6,214-21 and 6,223-25 ft. in the Rushing zone of the Pettet. The well is Sabine Pipe & Supply Co. (J. K. Wadley) 1 Maud N. Scott in SE SE NW 9-14n-13w.

LOUISIANA OFFSHORE

Second Oil Pay Opened in New South Timbalier Field

The second well in South Timbalier Block 86 field, 23 miles off Lafourche Parish, in the Gulf of Mexico, is opening a deeper sand than that productive in the field's discovery well.

The field was discovered late in 1956 with oil production from Miocene sand at 12,167-85 ft. The second well is perforated at 12,838-66 ft.

Both wells were drilled by Sinclair Oil & Gas Co., as operator, with El Paso Natural Gas Co., Sohio Petroleum Co., and Peoples Production Co. as co-owners. Each owns one-quarter interest.

During a 6-hour test, through 5/32-in. choke, the new well (2-A OCS-0605) flowed at the rate of 301 bbl. of 33.4°-gravity oil per day with gas-oil ratio of 680 cu. ft. per bbl.

It also is potentially productive from a slightly shallower zone, tested earlier. During a 12-hour drill-stem test of that pay, perforated at 12,725-43 ft., flow was at the rate of 2,450,000 cu. ft. of gas and 53 bbl. of clean 46.1°-gravity condensate. Test was open through 3/16-in. choke.

The wells were drilled from the same self-contained platform in 92 ft. of water. Drilling already is under way on the platform's third well, which will be bottomed a location east-northeast of the discovery well. Rimrock-Tidelands, Inc., is contractor. The group has a 5,000-acre federal lease-concentration in Blocks 85 and 86.

SOUTH LOUISIANA

Montegut's Second Well Discovers Oil Production

Southern Natural Gas Co.'s second well for its Montegut field, 16 miles southeast of Houma, is rated good for 110 bbl. of 34.7°-gravity oil per day. Completion gage was through ⅛-in. choke. Flowing pressure was 3,100 psi., and gas-oil ratio 4,460 cu. ft. per bbl. Pay is perforated at 12,190-92 ft.

The operator's discovery well, 2 South Shore Oil & Development Co., was completed last February. It was productive of gas-condensate with pay perforated at 12,179-84 ft. The second well, 1-A Waterford, is the northeast offset. It was drilled to 14,526 ft. Discovery well went to 13,609 ft.

The area is 2 miles north of the large Lirette gas area, discovered in 1937. It is about a mile from the Lafourche Parish line.

Outpost Opens Deep Pay At South Lake Charles

Signal Oil & Gas Co. has a new deep-pay discovery off the northeast side of the South Lake Charles field, 8 miles south of Lake Charles in Calcasieu Parish.

It is in the company's 1 Greathouse, in 9-11s-8w, completed as a high-pressure gas-condensate producer from casing-perforated interval at 13,250-13,300 ft.

Tested through ⅛-in. choke, the well flowed 2,000,000 cu. ft. of gas and 130 bbl. of condensate per day. Flowing pressure registered 7,200 psi.

Abnormally high pressures presented exceptional hazards and problems in the drilling of this well, the first to be completed in the area below 11,000 ft.

MICHIGAN

Testing has been in progress for several weeks, following a 1,500-gal. reacidization at Granville C. Berlin 1 Askevich, SW SW SW 1-16n-2e, Mills Township Dundee discovery well, Midland County. Well was reported this week to be flowing 40 bbl. of oil and about 3 to 4 water a day on test after acid. Last week well was pumping and flow about 50 bbl. of oil, but little, if any agitation with pump was indicated this week to develop the average 40-bbl. flow.

Wildcat logged Dundee top at 3,366 ft. Pays showed at 3,450-52 and 3,458-63 ft. Hole was bottomed out at 3,463 ft. with about 1,100 ft. of free oil showing natural in 16 hours. First acid treatment ruptured 5-in. casing which was squeezed off and has delayed second acid treatment and a complete test of this wildcat's potential.

● Aurora Gasoline Co. and McClure Oil Co. 1 Rowe, SE NW NE 10-5s-3w, Scipio Township, Hillsdale County, northwest 20-acre offset to Scipio area Trenton oil and gas discovery well, was being deepened below 3,876 ft., headed for Black River formation after flow of oil from Trenton was not effectively improved with acid.

Well flowed as much as 4 bbl. of oil an hour natural at 3,823 ft. After a 1,000 gal. acid treatment well swabbed and flowed only 26 bbl. of oil in 5½ hours. At 3,852 ft. well was swabbed dry and filled with 500 ft. of free oil on a short test, but it was not believed that additional pay had been drilled between 3,824 ft. and the testing point. Natural oil flow subsided to point where well produced about 1 bbl. of oil every 2 hours by swabbing, prompting attempt to increase production with acid.

MISSISSIPPI

First Field Indicated For Walthall County

A rank wildcat in southeastern Walthall County flowed gas and got a 100-ft. condensate recovery in a drill-stem test of a lower Tuscaloosa stringer sand. If it makes a well, it will give this southern Mississippi county its first production of any kind.

The wildcat, being drilled by Skelly Oil Co. and Kin-Ark Oil Co., tested a 43-ft. interval at 9,576-9,619 ft. Tester was open 76 minutes through ¼-in. chokes, getting the 3,000-ft. water cushion to the surface in 7 minutes. Bottom-hole flowing pressures were 3,810 psi., initial, and 4,280 psi., final. Maximum top pressure was 3,300 psi. Shut-in pressure was 4,391 psi. after 1 hour.

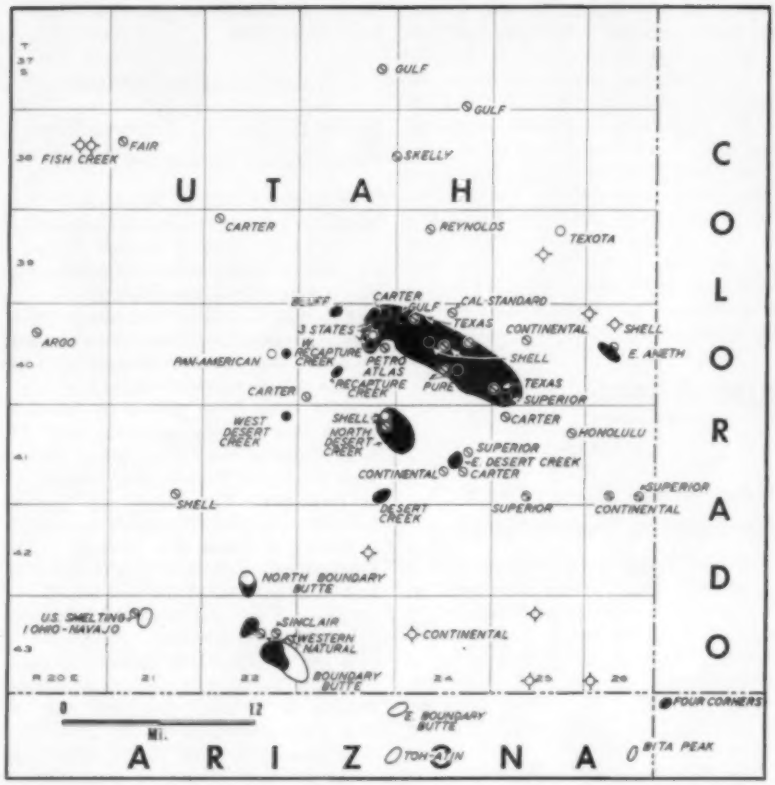
In addition to the 100 ft. of clean condensate, 295 ft. of condensate-cut mud and 200 ft. of condensate-cut water cushion was recovered.

The indicated gas-condensate production is being passed up for the time being. Hole is to be carried into the Lower Cretaceous section with a depth objective of 13,500 ft.

Pay-interval tested was approximately 130 ft. below the top of the lower Tuscaloosa (Upper Cretaceous). Another drill-stem test slightly lower in the section, at 9,641-81 ft., got salt water.

Location of the well, 1 Dexter, in 6-1n-13e, is only a short distance inside the county from Marion County. Nearest production is in Hub field, 6 miles northeast in the latter county. Sandy Hook field, also in Marion County, is about 10 miles southeast. Both are oil-productive from lower Tuscaloosa sands. Hub also has shut-in gas-condensate production from the Eutaw (Upper Cretaceous) zone, and from a Lower Cretaceous sand.

ARROW points to Skelly Oil-Kin-Ark indicated lower Tuscaloosa discovery in southeastern Walthall County.



THE ANETH TREND in the Paradox basin of southeastern Utah continues its phenomenal growth. Here is the activity map through April 29. This is the nation's hottest new oil province. Drilling is expected to increase considerably during the remainder of 1957. Recent new fields are East Desert Creek and West Recapture Creek.

ROCKY MOUNTAIN

UTAH

Aneth Grows in Two Directions

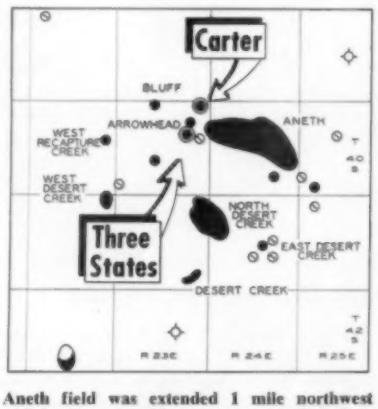
After 2 weeks of relative quiet for the booming Aneth trend area of the Paradox basin, things began to pick up again last week. Carter Oil Co. extended Aneth 1 mile to the northwest at 1 Hickman-Federal in C SE SW 1-40s-23e, and Three States Natural Gas Co. moved production 1 mile west at 2 Arrowhead in NE NE SW 14-40s-23e.

Carter's well flowed oil from upper Hermosa perforations at 6,130-80 ft., while Three State's well made 70 bbl. per hour from the Pennsylvanian. There are now 30 producing wells in Aneth field itself, all from the Pennsylvanian-Paradox except two — these produce from the upper Hermosa - Pennsylvanian, just above the Paradox.

Three States' well is ½ mile southwest of the 1 Arrowhead discovery well, completed last year for 707 bbl. per day. It is 1 mile west of Aneth field and 2 miles northeast of Recapture Creek. Location has been made for a third well by Three States at 3 Arrowhead in C SW NE 14-40s-23e, between the 1 and 2 wells.

Shell Oil Co. announced completion of its well 21-16 State Three on the north flank of Aneth field, with an initial production of 480 bbl. of oil per day from the Paradox formation.

The third of three wells so far drilled on a section of land leased from the State of Utah, 21-16 State Three had an initial production of a 3-hour



Aneth field was extended 1 mile northwest and 1 mile west with success reported at Carter Oil Co.'s 1 Hickman-Federal and Three States Natural Gas Co. 3 Arrowhead.

test of 480 bbl. per day, no cut, 36-/64-in. bean, 310 M.c.f. gas per day and a gas-oil ratio of 750. The well is shut in pending completion of production facilities.

The original well completed by the company in the state-owned section was 14-16 State Three, completed on October 15, 1956, flowing 480 bbl. per day. Shell has announced a drilling program of from 13 to 16 wells for the section.

The fourth well to be drilled in the section, 34-16 State Three, was spudded on April 15, 660 ft. north, 1,980 ft. west of the southeast corner of 16-40s-24e, in San Juan County, Utah.

East Aneth Area Strike Shut In After Oil Flow

The 1 Navajo-H wildcat, 2 miles east of Aneth field in C SW SE 21-40s-25e, San Juan County, was shut in after flowing 7 bbl. of oil per hour on tests of the Pennsylvanian at 5,930-52 ft. Continental Oil Co.'s wildcat went to 7,637 ft. The operator is now waiting for storage facilities.

Pump Going Up at Aztec-Montezuma Well

Gulf Oil Corp. 1 Gulf-Aztec-Montezuma-Federal, a wildcat 8½ miles southeast of Blanding and considerably north of the Aneth trend, is going on pump. The well made 32 bbl. of oil and 104 bbl. of salt water in 11 hours . . . was swabbed and then flowed for awhile during the test. Perforations are at 5,828-44 ft. Top of the Hermosa-Pennsylvanian is 4,760 ft.

Another well in the area, the 1 Gulf-Aztec-Blanding-Federal, SW SW SW 35-37s-24e, is drilling below 5,198 ft.

MONTANA

Loucks Discovery Completed in Red River

Amerada Petroleum Corp.'s 1 Loucks in C NE SW 34-36n-52e, Sheridan County, was completed flowing 312 bbl. of oil and 34 bbl. of water per day to open Red River-Ordovician production in northeastern Montana. This Outlook area wildcat strike is producing from perforations at 9,896-9,916 ft.

Location of the new-pay strike for the area is 4 miles southwest of the 1 Tange discovery, the Outlook field-opener. That well produces from the Silurian at 9,056-74 ft. It was completed flowing 2,742 bbl. of oil daily.

The other wildcat in this area, 1 Ruegsegger, C NE NE 24-36n-52e, 2 miles northwest of Outlook, flowed an estimated 406 bbl. of oil and 205 bbl. of salt water in 27½ hours through various size chokes from Silurian at 9,067-91 ft. Another wildcat is drilling 8 miles northwest of 1 Ruegsegger at 1 Grant, NE NW 2-36n-51e. Amerada is below 4,800 ft. at this 10,000-ft. Winnipeg try.

Northern Pacific-Shell To Develop 15,000 Acres

The Northern Pacific Railway and Shell Oil Co. will immediately start joint exploration and development of a new area comprising more than 15,000 acres in the Williston basin in eastern Montana, NP President Robert S. Macfarlane announced at the annual meeting of the railway's stockholders in St. Paul.

The operating agreement just concluded with Shell covers oil and gas interests owned by the two companies in the Wills Creek area in Fallon and Wibaux counties, adjoining and east of the productive Cabin Creek field and at the south end of the Pine unit.

Northern Pacific and Shell are joint operators of the Cabin Creek field and Shell operates the Pine unit, where NP has a royalty interest in approximately one-half of the productive lands.

Working interests of the two companies under the new operating agreement will be about equal, the president said. Northern Pacific will have a royalty interest in production from its lands in addition to the company's working interest production, he said.

Macfarlane told the stockholders that Northern Pacific's net oil production for the first quarter of 1957 was 492,-022 bbl. as compared with 299,614 bbl. for the first quarter last year. First quarter revenue from oil and gas was $1,091,831, he said, as compared with $657,758 in 1956.

ARIZONA

Noncombustible Gas Reported at Apache County Wildcat

Noninflammable gas was reported at Kerr-McGee Oil Industries, Inc. 1 State in NE NW SE 4-19n-26e, Apache County, northeastern Arizona. The wildcat flowed this nonburning gas at the rate of 140 M.c.f. per day from perforations at 1,010-16 ft. The gas is 90 per cent nitrogen, 7-8 per cent helium, the rest is carbon dioxide and inert gasses.

The operator has moved this rig over to 2 Fee in C N½ NW 35-20n-26e. Three wells are reportedly planned for this area. Helium shows have been reported in this area for several years. The operator is looking for helium gas in commercial volume.

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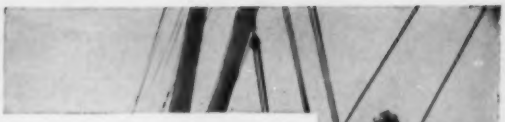
Write for Bulletin #7072



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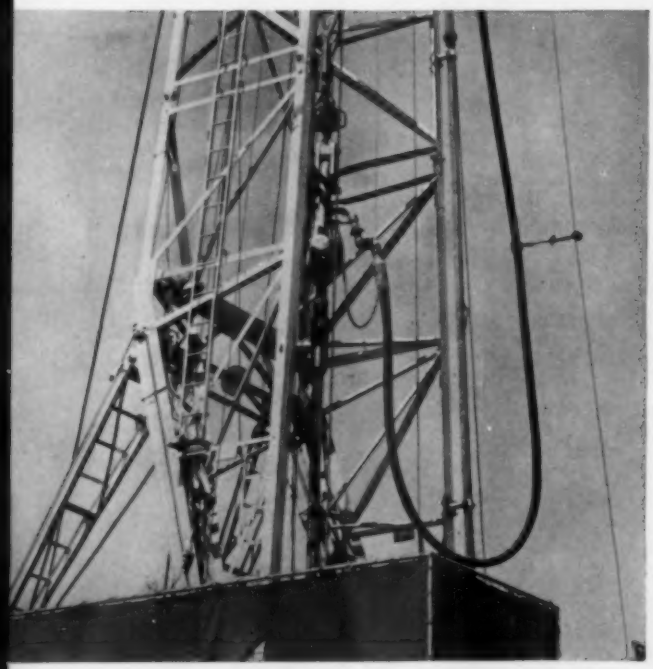

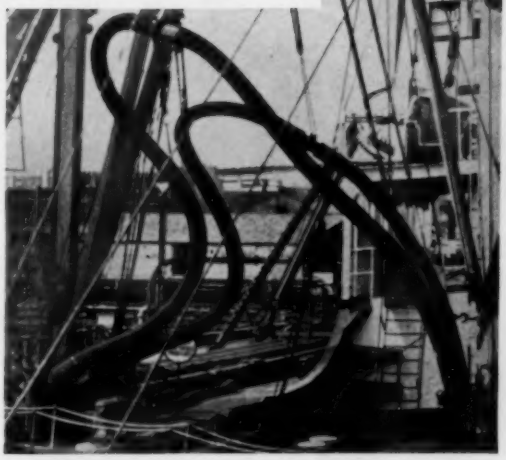

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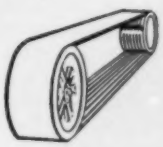

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NORTH DAKOTA

Sanish Is New Pay In Antelope Field

The Sanish sand of lower Mississippian age is a new pay for Antelope field in McKenzie County. Pan American Petroleum Corp. 1 Lewis, W½ SE SE 7-52n-94w, flowed 640 bbl. of oil per day on tests of this sand at 10,273-97 ft. Flow was on 16/64-in. choke.

Antelope is a Madison-Mississippian producer and is one of the state's best new fields. The Sanish sand produces at Sanish field.

Silurian Oil Flows at Beaver Lodge Wildcat

Silurian oil flowed at Amerada's deep test at Beaver Lodge on the Nesson anticline in Williams County. The 1 Iverson-Nelson in NW SE NE 2-155n-96w, flowed 147 bbl. of oil and 68 bbl. of water daily on 32/64-in. choke from perforations in the Silurian at 11,696-11,766 ft. Gravity of the oil is 52.5°.

This deep discovery prospect also flowed commercial amounts of gas and condensate from the deeper Red River-Ordovician at 12,696-11,784 ft. Flow was 332 bbl. of condensate in 23 hours and 40 minutes on ⅜-in. choke.

NEW MEXICO

SAN JUAN BASIN

Gulf Gets More Oil at Gallup Confirmation

More oil flowed on tests at Gulf Oil Corp. 1 Western Federal, confirmation to a gas discovery at 1 Blackrock Federal in San Juan County.

The Gulf well flowed 222 bbl. of oil in 24 hours on ¾-in. choke from perforations in the Gallup sand at 5,070-5,226 ft. It was then shut in, reopened, and flowed 40 bbl. of oil on ¾-in. choke in 4 hours.

This well will confirm the gas discovery in C NW NW 20-26n-11w, a Gallup producer.

SOUTHEAST NEW MEXICO

Bagley Field Outpost Flows Oil and Salt Water

Amerada Petroleum Corp. 1-B Mathers, northwestern Lea County wildcat off the northwestern tip of Bagley field, flowed oil and salt water on a drill-stem test in the Pennsylvanian.

The test was run at 9,889-9,930 ft., and was open slightly under 6 hours. Gas surfaced in 10 minutes, water blanket in 1 hour and 20 minutes and oil in 1 hour and 55 minutes. Over the balance of the test it flowed 26 bbl. of 43.6° oil and 42 bbl. of salt water. Flowing pressure ranged from 705-1,455 psi.

An earlier test, also in the Pennsylvanian, at 8,580-8,690 ft., flowed 101 bbl. of 40° oil with no water. Location is in SE NW 3-11s-33e, or about 1 mile northwest of nearest Pennsylvanian production in Bagley field.

Gas kick in deep test . . . Shell Oil Co. I James Ranch Unit, projected 15,300-ft. Eddy County Delaware basin wildcat, stopped drilling at 12,944 ft. to increase the weight of drilling mud. Operators reported a gas kick at 12,929 ft., in the Pennsylvanian.

Location is 24 miles east and slightly south of Carlsbad, in 36-22s-30e. Nearest production is a lone Delaware sand producer, 2¼ miles to the northwest.

New work in Roosevelt County . . . Magnolia Petroleum Co. has scheduled its 1 A. R. Haley as a southwest offset to the discovery of the 3-well Milnesand (Pennsylvanian) field in southern

2½ YEARS
OF PUMPING SERVICE
. . . no replacements other than spark plugs and magneto points on this
WISCONSIN Engine

HERBERT FOWLER, pumper for the Ben Culver Oil Wells, operating in Osage County, Oklahoma, has been pumping Well No. 6 with a 2-cylinder Wisconsin Model TFPD Wisconsin Air-Cooled Oil Well Pumping Engine since its installation in Feb., 1954 . . . producing from the Mississippi Chat formation at about 2,000-ft. depth.

Fowler reports, in a sworn statement dated Sept. 4, 1956, that this engine was operated up to 10 hours per day, with an average of 6 hours per day pumping both oil and water. During the 2½-year period covered by this report, the engine had never been removed from its foundation. The cylinder heads had never been removed, valves had been adjusted only twice and the only service parts used were two sets of spark plugs and two sets of magneto points.

It is performance records such as this that offer convincing proof of Wisconsin Heavy-Duty Air-Cooled Engine stamina and low-cost maintenance. They're built to "take it" under *your* operating conditions . . . and there's an engine of the right size to fit your requirements . . . 4-cycle single cylinder, 2- and 4-cylinder models, from 3 to 56 hp., backed by a service organization second to none for swift attention to your needs.

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Roosevelt County. Location is in SE SE 13-8s-34e. Projected depth is 9,600 ft.

Lea County . . . Sunray Mid-Continent Oil Co. 1-L State, deep exploration 6 miles northwest of Tatum, reported gas shows in the Mississippian.

On test at 12,850-12,971 ft., open 2 hours, gas surfaced in 23 minutes, at the rate of 169,000 cu. ft. per day. Recovery was 1,500 ft. of water blanket and 90 ft. of distillate and gas-cut drilling mud.

OKLAHOMA

OKLAHOMA PANHANDLE

Grand Valley Extension Gas Well Completed

A Morrow gas well in the extension area of Grand Valley field, Texas County, made 11,000 M.c.f. per day, natural, and a calculated open flow of 81,400 M.c.f. per day from perforations at 6,387-6,450 ft. The well is Carter Oil Co.'s 1 Orlando Joliffe, SE SE NW 35-3n-18eCM.

Another Carter well, the 1 Sims Unit in SW SW NE 25-1n-20eCM, Beaver County, is a new Morrow oil well for the Camrick field area. It made 65 bbl. of 37.5°-gravity oil in 4 hours, swabbing, from Upper Morrow perforations at 6,460-76 ft.

NORTHERN OKLAHOMA

Offset Well at Southwest Ingersoll Shows Oil

The offset well to new Southwest Ingersoll pool in Alfalfa County flowed oil on production tests in the Cherokee-Pennsylvanian sand at 5,282-5,308 ft. The well is Barrett Petroleum Co. 1 Myers, C SE SW 29-27n-11w.

The operator will fracture the zone for further tests. The discovery well of this pool is the 1 Beltz in NE NE SE 31-27n-11w. It made 2,060 M.c.f. of gas per day and 1½ bbl. of oil per hour after treatment of the Cherokee at 5,310-33 ft.

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SOUTHWEST OKLAHOMA

Long Extension Added To Knox Deep Play

Bromide - Ordovician production in Knox field has been extended 3 miles southeast into Stephens County from Grady County. British - American Oil Producing Co. et al 1 Kreiger, C SW SW 3-2n-5w, flowed 6,800 M.c.f. of gas per day from perforations in the second Bromide sand at 14,807 ft., 192 ft. high to the state's deepest hole in Knox field's 29-3n-5w area.

SOUTH-CENTRAL OKLAHOMA

Bromide Oil Flows at Deep Washington Well

Bromide-Ordovician oil is reported at Goff-Leeper Drilling Co.'s 1 Sasser in C SE SE 8-7n-2w, east of McClain County's deep Washington area. The well flowed 253 bbl. of oil in 12 hours on test of perforations at 8,291-98 ft.

Well No. 200 Added To Short Junction

Cleveland County's now famous Short Junction field added its 200th producer last week. The new well is Ohio Oil Co. 3 Leslie in C NW SW 18-10n-3w.

Production at the well was 88½ bbl. per day on ¼-in. choke from perforations at 7,798-7,824 ft. in the Bois d'Arc section of the Hunton. A gas flow of 185 M.c.f. per day accompanied the oil flow.

Dual Completion Will Expand Noble Townsite Pool

A Bromide and Tulip Creek sand well in Cleveland County's Noble Townsite pool flowed 248 bbl. of oil in 19 hours on ½-in. choke from the Tulip Creek sand at 8,226-30 ft.; 122 bbl. of oil in 17 hours from the Bromide at 7,926-32 ft. The well is Anderson-Prichard Oil Corp. 1 Rollins, SW NW SE 27-8n-2w.

Bromide Oil Flows at Rocky Point Field Well

Dual completion is in order at Oil Capitol Corp. 1 Fssenbeck in NW NE SE 32-8n-1w, the second well in new South Rocky Point field, Cleveland County. The well flowed 252 bbl. of oil in 19 hours, or 6½ per hour on 12/64-in. choke from Bromide sand

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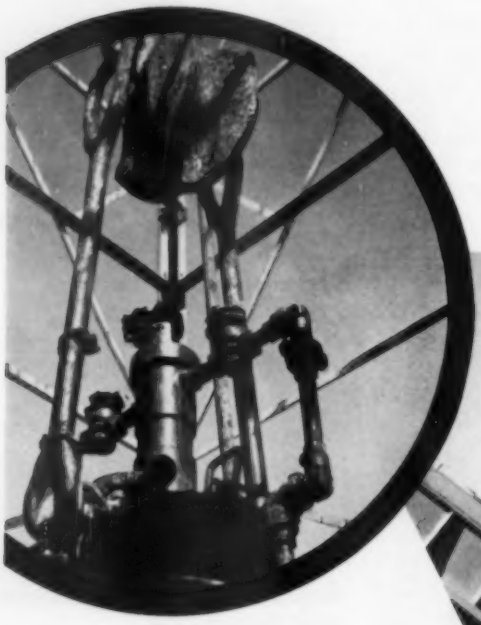

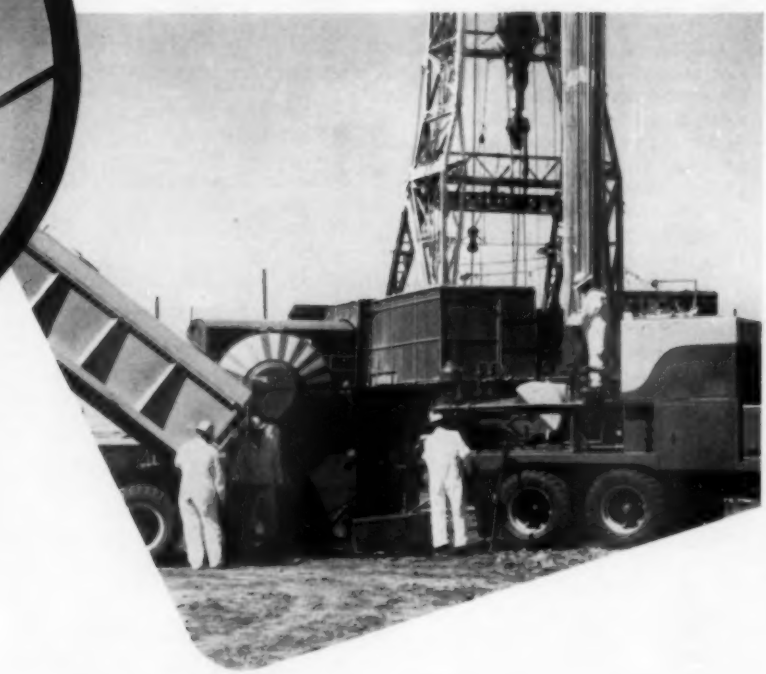

A well that gets off to a strong start is well along the way to a lifetime of profitable production. One of the absolute "musts" for a strong start is a good primary cementing job with the right equipment. Halliburton Casing Equipment is research-perfected to permit running casing faster and with greater safety. Positive centering permits placement of cement completely around casing for better protection. Formation walls are cleaned as casing is rotated. A stronger bond is established between cement and formation surfaces. All with the sole aim of protecting production for the lifetime of the well.

HALLIBURTON

OIL WELL CEMENTING COMPANY

DUNCAN, OKLAHOMA

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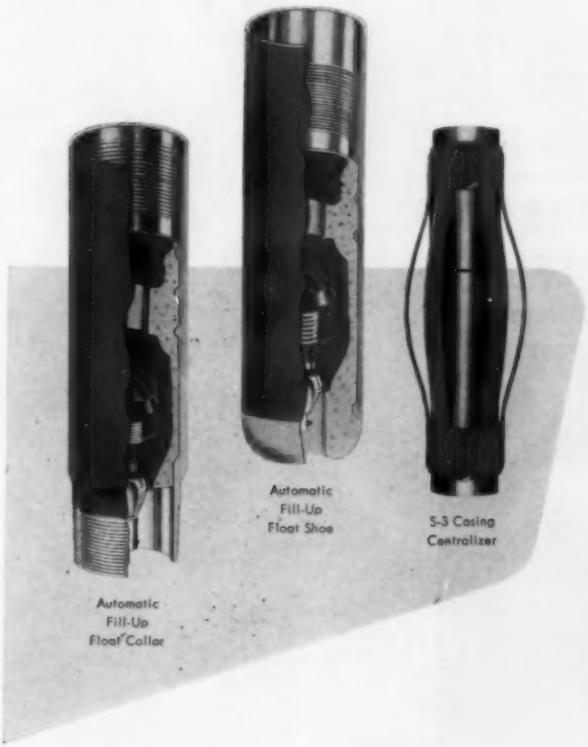

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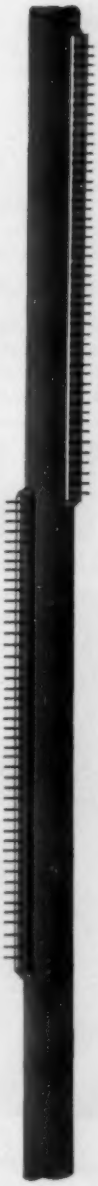
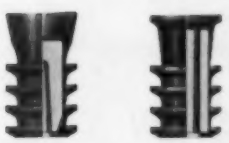
3. You get cleaner formation surfaces and a better cement bond when you remove mud cake with Halliburton ROTO WALL CLEANERS They clean as casing is rotated and aid in a more uniform distribution of cement without channeling.



Roto Wall
Cleaners



4. With every Halliburton cementing job pipe is wiped clean and possibility of contamination of cement slurry is practically eliminated by Halliburton's exclusive 5-Wiper Cementing Plugs. A Halliburton service beyond the fee... added protection to a quality job at no extra cost.

CEMENTING SERVICE

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at 7,464-78 ft. The well also flowed 12 bbl. per hour from the Tulip Creek sand at 7,738-41 ft.

TEXAS

TEXAS GULF COAST

San Antonio Bay Discovery Produces Gas-Condensate

Discovery of a new field in San Antonio Bay, Calhoun County, is reported by Tidewater Oil Co.

The discovery well, 1 State, in Tract 139, flowed gas and condensate during a preliminary drill-stem test of casing-perforated interval in Frio sand at 9,051-56 ft.

Gas flow, through a 5/32-in. choke, was at the rate of 2,800,000 cu. ft. per day. Liquid recovery was not gaged. Gravity was 46°. Flowing pressure was 5,000 psi.

Location is 3 miles from shore in 6 ft. of water. It is 7 miles north of Seadrift, and 3 miles northeast of nearest production in San Antonio Bay field. It is about 3½ miles west of Steamboat Pass field.

The well is in a 2,560-acre block. Tidewater also has full interest in two additional sections in the vicinity.

New Oil Reservoir Tapped Near Palacios Gas Area

Brazos Oil & Gas Co. is opening a new Frio oil reservoir ¾ mile northwest of nearest gas production in Palacios field, in western Matagorda County.

Pay is perforated at 9,052-64 ft. It tested a daily flow of 71.5 bbl. of 35°-gravity oil through ⅛-in. choke. Its pressure was 890 psi., and gas-oil ratio 1,173 cu. ft. per bbl.

Location is 2½ miles north of Palacios, on the operator's Lena Harrison lease. Hole was drilled to 9,000 ft. by J. E. Michael. Brazos then took it over and deepened it to 11,005 ft., sidetracked at 7,550 ft., and drilled to 10,225 ft.

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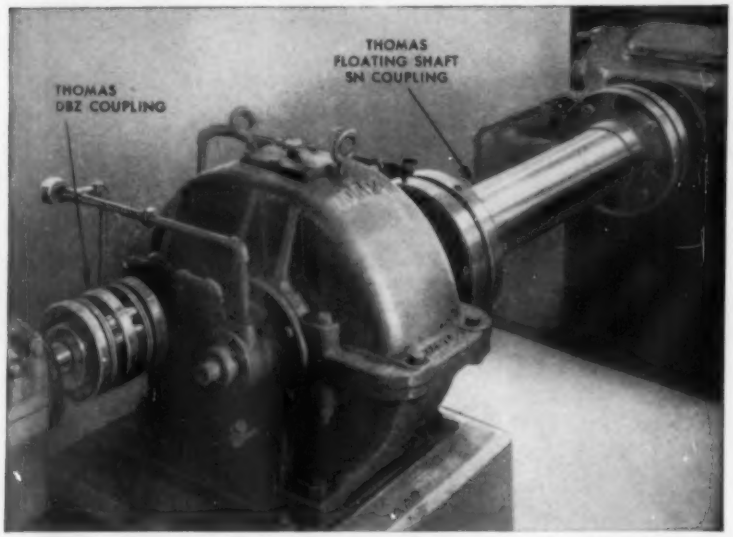

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Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING COMPANY
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TEXAS PANHANDLE

Phillips Gets Douglas Oil At Ochiltree Venture

A Phillips Petroleum Co. wildcat in the central part of Ochiltree County, 3 miles south of the town of Ochiltree, recovered oil on a drill-stem test of the Douglas - Pennsylvanian sand at 5,702-31 ft.

Recovery on the test was 10 ft. of oil-cut mud, 180 ft. of slightly muddy oil and 4,910 ft. of free 42.4°-gravity oil. Gas surfaced in 6½ minutes at the rate of 214 M.c.f. per day.

This indicated discovery is in Section 572, Block 43, H&TC Survey.

Missouri Is New Pay In Harbaugh Field

Harbaugh field in southern Ochiltree County has a new producing zone, the Missouri lime-Pennsylvanian. The discovery well is M. A. Machris 11-147 Harbaugh in Section 147, Block 13, T&NO Survey. The well flowed oil at the rate of 33 bbl. per day, natural. Perforations are at 6,996-7,006 ft.

EAST TEXAS

Big Confirmation Well at East Texas Pettet Strike

A one-well pool in East Texas last week had prospects of a big offset producer. The pool is Northeast Hallsville in central Harrison County and the second and extension well is Amerada Petroleum Corp. 1 E. C. McBrayer.

Drill-stem test in Pettet . . . No. 1 McBrayer made its best showing on a drill-stem test in the Crane zone of the Pettet at 6,910-68 ft., where it flowed

at the estimated rate of 35 bbl. of 54°-gravity oil an hour on ¼-in. choke, or better than 800 bbl. daily. Maximum surface flowing pressure on the test was 320 psi., bottom-hole flowing pressure ranged from 1,065-1,125 psi., with shut-in pressure reaching 3,140 psi. Gas-oil ratio was 1,700 : 1.

Northeast Hallsville field was opened by Amerada Petroleum, Bill Tipton and Associates' 1 John White in December 1956. Initial potential was 340 bbl. of oil a day on 14/64-in. choke, from the Crane zone of the Pettet at 6,957-66 ft. The big Woodlawn field, to the east, produces from the Pettet. Lansing, North, and Whelan fields, to the west of 1 Brayer, have production in the Rodessa and Travis Peak.

Location of Amerada's second test is approximately in the center of S. Choat Survey, ¾-mile southwest of the discovery and 6 miles northwest of Marshall townsite.

SOUTH TEXAS

Spring Field Trip—South Texas Geological Society

On Friday, May 17, 1957, the South Texas Geological Society will hold a spring field trip for a visit to Eocene outcrops in Milam and Burleson counties. The section to be studied is from the upper Wilcox to the Crockett formation of the Claiborne Group. Dr. Fred Smith of Texas A. & M. College will be chairman and leader of this trip. This trip is a repetition of the one which was conducted for members of the Gulf Coast Association of Geological Societies on November 3, 1956.

The trip will be made by private automobiles, arrangements for which must be made individually.

Starting point . . . Assembly point will be at the town of Milano, Milam County, which is 70 miles northeast of Austin. The Milano fault will be studied at the starting point. Cars will continue on to the Brazos River, o.. the road to Hearne. The caravan will travel to the southeast down a road paralleling the Brazos River, studying all formation contacts and good fossil localities. The trip will end on the Yegua formation at the town of Bryan in Brazos County. This will be a 1-day trip.

Guide books will be $2.50 each and will be distributed at Milano on the morning of the trip.

As it is necessary to know the exact number of lunches to be prepared, send a check for $1.20 for each lunch, made payable to the South Texas Geological Society. All orders for lunches must be received not later than May 15 and should be mailed to J. B. Souther, 1126 Milam Building, San Antonio, Tex.

NORTH TEXAS

Taylor Wildcat Flows Oil on DST

Southern Taylor County had prospects of a flowing Cross Cut sand discovery at Columbian Fuel Corp. 1 W. S. Shaffer. Location is 6½ miles northwest of Bradshaw, in Section 154, Block 64, H&TC Survey.

Operators reported top of the sand at 4,378 ft. on elevation of 2,177 ft. A 20-minute test in the top of the sand, from 4,379-86 ft., had gas in 1½ minutes, calculated at the rate of 1,500,000 cu. ft. daily. Oil surfaced in 9 minutes, but apparently was not allowed to flow for any length of time. Flowing pressure was around 1,150 psi.

Operators cored additional sand with good oil shows between 4,386-98 ft., then drill-stem tested the same interval. Gas surfaced in 2½ minutes and oil in 22½ minutes. The flow of oil was not estimated and recovery was 500 ft. of oil with no water. Maximum shut-in pressure was 1,745 psi.

The test was scheduled to 5,000 ft., and operators drilled ahead following the above test.

Location is 1 mile north of Herber field, which has pay in the Gray and

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Cross Cut sands, but is separated from the area by a 4,400-ft. dry hole.

Gas Discovery in Wise County

Cities Service Oil Co. 1 Sealy "B" opened second conglomerate gas production 4 miles southwest of Chico townsite in west-central Wise County. Potential was at the rate of 8,000,000 cu. ft. of gas a day, from pay at 5,217-50 ft. Shut-in tubing pressure was 840 psi.

Deep Well in Montague

Montague County gained a deep exploration to be drilled 4 miles northwest of St. Joe. The project is Cheyenne Oil Corp., Wichita Falls, 1 L. N. Husbank. Location is on a 158-acre lease in the C. Boger Survey, A-65, and ¼-mile southwest of a 7,200-ft. dry hole. Projected depth of 1 Husbank is 7,200 ft.

Workover Job Makes Ellenburger Discovery

General American Oil Co. of Texas has filed for discovery allowable on its 1 R. L. Brixey, workover well 9 miles southwest of Henrietta in west-central Clay County.

Perforations in the Ellenburger were at 5,954-61 ft. On final test it pumped 154 bbl. of 40° oil a day. Gas-oil ratio was 350 : 1. The well is in Block 3, Halsell Subdivision 1.

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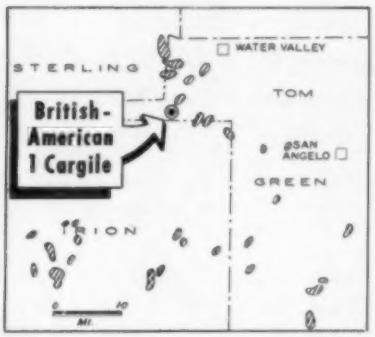
WEST TEXAS

Tom Green County Wildcat Flows 484 BOPD On Completion

The panhandle of Tom Green County gained a good Wolfcamp discovery at British-American Oil Producing Co. 1 Cargile, about 10 miles southwest of Watervalley, in 15-5-H&TC Survey.

The daily potential of 484 bbl. was calculated from a 12-hour flow test which tanked 242 bbl. of 41° oil, with no water, through 22/64-in. choke. Pay section was perforated and fractured between 5,684-94, 5-713-19 ft. Flowing tubing pressure was 150 psi. and gas-oil ratio was 196 : 1.



British-American's Wolfcamp discovery is ¾-mile north of Irion County line, and 8 miles northeast of O. H. Triangle field, which is nearest deep production.

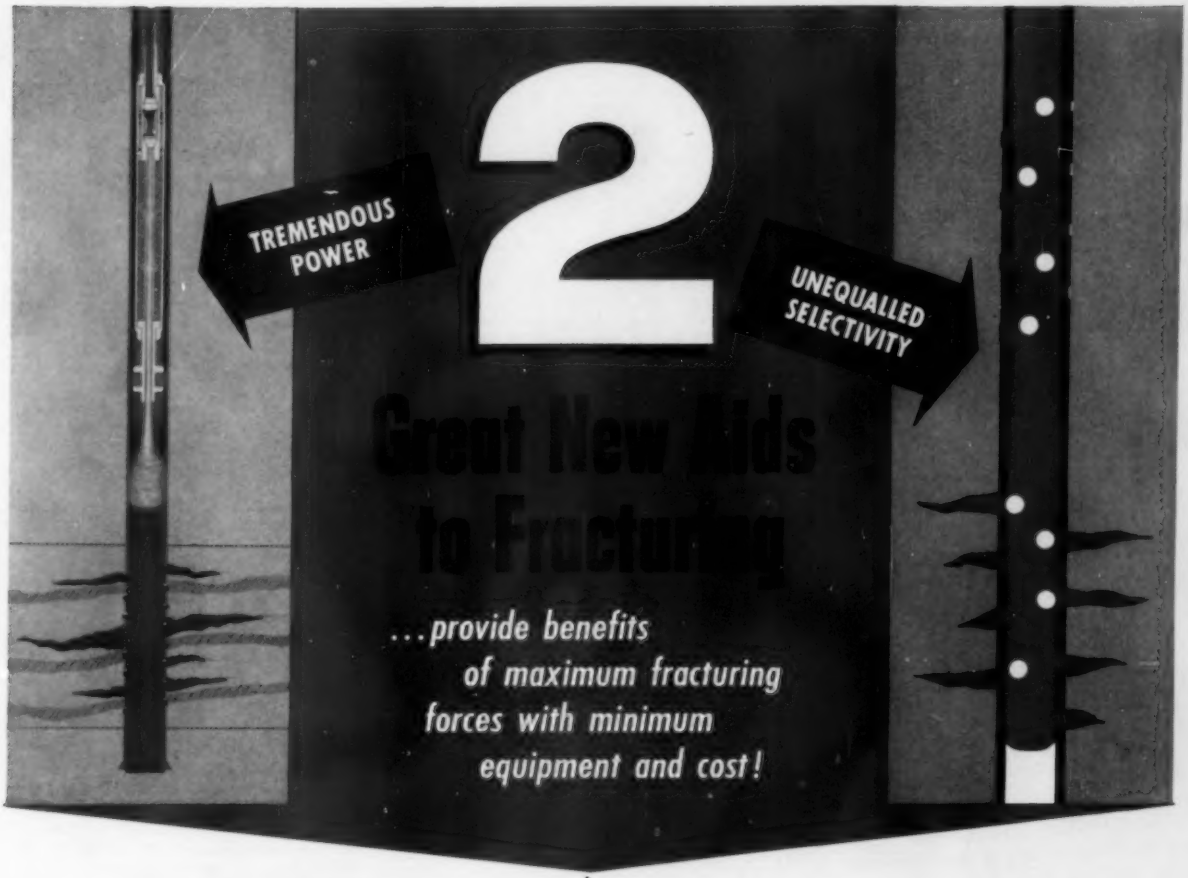
Operators picked top of pay at 5,684 ft. on elevation of 2,325 ft. Total depth was 7,865 ft.

Dawson County discovery . . . Humble Oil & Refining Co. 2 M. R. Stewart has been completed as a Spraberry discovery, 19 miles southeast of Lamesa in southeastern Dawson County.

On potential test the well pumped 168 bbl. of oil, plus 40 per cent water, from perforations at 7,472-90 ft. Gas-oil ratio was 349 : 1. Location is in NE SW 5-33-T4N-T&P Survey, which is 1½ miles west of Jo Mill-Spraberry field.

Howard County reef prospect . . . Flow tests were continuing at Woodson Oil Co. 1 Pauline, 22-miles northeast of Big Spring. A gage on perforations at 7,463-48 ft. was at the rate of 20 bbl. of oil an hour. Top of the reef was 7,444 ft. on ground elevation of 2,344 ft.

Terry County . . . The Texas Co. has run casing to 12,770 ft. for completion tests at its 1 M. F. Taylor, Devonian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Select-O-Ball Service opens drainage channels that cannot be penetrated otherwise... provides penetration of fluid into a maximum number of productive intervals with minimum equipment. These free-floating balls—injected into the frac fluid stream—selectively shut off perforations opposite more permeable zones as they are treated... progressively concentrate fluid under greater pressures on tighter zones ...until full treatment is achieved.

NOTE: Select-O-Ball Service is equally effective for acidizing treatments.

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prospect 4½ miles southwest of Gomez in 129-D11-C&M Survey.

On drill-stem test the well recovered 222 bbl. of oil from perforations at 12,650-12,770 ft.

Successful Wildcats

ALBERTA

Imperial 4-17 Carmangay, LSD 4, 17-13-23w4. TD 8,696 ft. Banff sand oil well.

ARKANSAS

Conway County: Carter Oil Co. 1 J. A. Allen, SE SE NW 5-8n-17w. IP 5,871 M.c.f. of gas per day, Atoka sand 1,685-1,702 ft. Barton "A" sand 2,344-60 ft., 2,376-84 ft. TD 2,905 ft. New pay in Jerusalem pool (Barton "A" sand).

COLORADO

Washington County: Cutlass Oil-Calvert Drilling Co. 1 Bowen, C NE NW 8-2n-53w. IPP 68 BOPD, "J" sand discovery, new field. TD 5,005 ft. Skull Creek.

CALIFORNIA

Kern County: Bishop & Dolley, operators, 2 "Mon," SE NE 26-27s-28e, 25 bbl. daily, 15° gravity, 12 per cent cut, perfs. 1,300-93 ft. TD 1,393 ft. (New pool discovery on the east flank of the Dorsey area of Mt. Poso field).

Union Oil Co. of California 77-27 UOC-Hancock-Houchin-Guimarra, SE SE 27-31s-29e, 164 BOPD, 2.4 per cent cut, 35.1° gravity, perfs. 3,084 ft., 50 M.c.f., TD 9,325 ft. (New pool discovery ½ mile west or Arvin area and 2 miles southeast of Stenderup pool activity).

INDIANA

Gibson County: Buchman & O'Neal-Wausau Petroleum Co. 1 Kendle Smith, SW SE SE 8-2s-11w. IPP 22 BOPD, Penn. 858-64 ft. TD 2,396 ft. Extends West Princeton pool.

Vanderburgh County: Stouder Drilling Co. 1 Herschelman, SE SW 7-6s-11w. IPP 192 BOPD, Waltersburg sand 1,828-47 ft. Tar Springs sand 1,962-69 ft. TD 2,722 ft. Extends Belknap pool.

KANSAS

Barber County: Caves & Quillan 1 Bevans, SE SE SE 6-34s-11w. IP 5,339 M.c.f. of gas per day, Miss., 4,564-4,630 ft. TD 4,733 ft. Opens Rhodes field.

Ellis County: NCRA 5 Cave, C S½ NE SW 8-11s-18w. IPP 44 BOPD, 1 per cent water, 17.5°, Arbuckle 3,565-70 ft. TD 3,570 ft. New pay in Cochran pool.

Alpine Oil Royalty Co. 1 Roth, W NW SW 23-15s-17w. IPP 163 BOPD, 39.5°, Lansing-Kansas City 3,445-52 ft. TD 3,561 ft. Opens Southeast Degenhart pool.

Harper County: Pickrell Drilling Co. 1 Davis, SE SE SE 5-32s-9w. IPF 104 BOPD, 27 per cent water, 30°, Miss. 4,330-46 ft. TD 4,410 ft. Opens Northeast Sharon pool.

Haskell County: Trees Oil Co. 1 Moore, C NW NW 21-30s-34w. IPP 215 BOPD, 38°, Morrow 5,370-80 ft. TD 5,705 ft. New pool.

Graham County: Imperial Oil Co. 1 Frazier, NW NW SE 8-9s-23w. IPP 28 BOPD, 38°, Lansing-Kansas City 3,841-45 ft. TD 3,920 ft. Opens Southwest Brush Creek field.

NCRA 2 Shaw, C E½ NW NW 7-9s-21w. IPP 56 BOPD, 38°, Lansing-Kansas City 3,676-79 ft. TD 3,855 ft. New pay in Morel pool.

Sedgwick County: BT and JF and LB Newman 2 Emma Roy, SE SE SW 13-29s-1w. IPP 143 BOPD, 30 per cent water, 41°, Miss. 3,340-46 ft. TD 3,353 ft. Opens West Brumley field.

Sumner County: Herndon Drilling Co. 2 Subera, SW SW SW 22-34s-3w. IPP 138 BOPD, 37 per cent water, 50°, Simpson 4,740-44½ ft. TD 4,751½ ft. Opens Subera pool.

KENTUCKY

Breckenridge County: Winmar Oil Co. 1 Fuqua, 6-N-36. IPP 1 BOPD, Benoist 324-43 ft. TD 343 ft. New pool.

Hopkins County: W. Sargent 1 Wyatt, 9-J-21. IP 1,000 M.c.f. of gas per day, Bethel 1,570-80 ft. TD 1,580 ft. Opens Dalton pool.

Webster County: I. B. Browning 1 Johnson, 10-L-22. IPP 21 BOPD, Penn. sand 1,563-77 ft. TD 3,150 ft. Opens South Dixon pool.

MONTANA

Sheridan County: Amerada Petroleum Corp. 1 Loucks, C NE SW 35-36n-52e. IPF 312 BOPD, 34 BW, 21/64-in. choke. Red River-Ordovician discovery, new field in Outlook area. TD 10,842 ft. Winnipeg.

NEBRASKA

Banner County: Lowell J. Williamson 1 Smith, C SE SE 19-17n-56w. IPP 187 BOPD, "D" sand discovery, new field. TD 6,895 ft. Skull Creek.

This announcement is neither an offer to sell nor a solicitation of an offer to buy these securities. The offer is made only by the Prospectus.

$48,000,000

Quebec Natural Gas Corporation

$12,550,000 First Mortgage Bonds,
6% Series due 1980 (Canadian)

$7,450,000 First Mortgage Bonds,
5½% Series due 1980 (United States)

$20,000,000
5¾% Subordinated Debentures due 1985 (Canadian)

800,000 Common Shares
(Par Value $1)

The Subordinated Debentures and the Common Shares are being offered in Units; each Unit will consist of a $100 principal amount Debenture and four Common Shares. Two Common Shares will be transferable separately at the option of the Company not earlier than May 20, 1957 and in any event on and after July 16, 1957, and the remaining two Common Shares will be transferable separately at the option of the Company not earlier than October 1, 1958 and in any event on and after January 1, 1960.

Certain of the Bonds and Units are being offered in Canada by Nesbitt, Thomson and Company, Limited, Wood, Gundy & Company Limited and Osler, Hammond & Nanton Limited.

In the United States certain of the Bonds and Units are being offered by the undersigned.

Prices { Bonds 100%
Per Unit $145.60 (United States)

plus accrued interest on the Bonds and the Debentures from April 1, 1957

Copies of the Prospectus may be obtained in any State only from such of the undersigned Underwriters as may lawfully offer the securities in such State.

Lehman Brothers — Allen & Company

Stone & Webster Securities Corporation — White, Weld & Co.

Butcher & Sherrerd

April 18, 1957.

PENNSYLVANIA

Indiana County, Young Township: Manufacturers Light & Heat Co., 4-4427 R. & P. Coal Co., 154,000 cu. ft. gas after second fracture, rock pressure 3,650 psi. in 5 days, chert 7,473 ft., gas 7,540 ft., and 7,710 ft., Oriskany sand 7,794-7,808 ft. TD 7,824 ft.

OKLAHOMA

Beaver County: Cabot Carbon Co. 2-A Sizelove, 34-4n-27eCM. IP 12,100 M.c.f. of gas per day, Hoover 4,280-4,316 ft. TD 7,267 ft. New field.

Cleveland County: Atlantic Refining Co. 1 Leona Bowles, NW SE NW 9-9n-2w. IPF 32,500 M.c.f. of gas per day, 60 BOPD, 68.6°, Prue 6,604-26 ft. TD 6,695 ft. New field.

Grant County: LeCuno Oil Co. 1 Horton, SW NW SW 35-25n-4w. IPF 1,700 M.c.f. of gas per day, 2.5 BDPD, 48°, Skinner 5,040-55 ft. TD 5,443 ft. New field.

N. T. Smith 1 Waldie, NE NE NE 30-28n-5w. IPF 14,078 M.c.f. of gas per day, 60 BDPD, Basal Pennsylvanian sand 4,711-42 ft. TD 4,742 ft. New pool.

Kay County: The Texas Co. 4 Heide Estate, SE SW NE 21-27n-1e. IPF 96 BOPD, 40°, Miss. chat 3,695-3,706 ft. TD 3,731 ft. New pay in East Blackwell pool.

Kiowa County: Lawrence & Fowler 1 Ed Smith, NE 18-6n-16w. IPP 4 BOPD, 34°, Pontotoc 317-23 ft. TD 323 ft. New pool.

Love County: Carson Colley 1 J. N. Pack, C NW SE NW NE 18-6s-2e. IPF 456 BOPD, Upper Deese 2,162-78 ft. Lone Grove 2,321-2,454 ft. TD 2,605 ft. New field.

The Texas Co. 1 Westheimer, C NW SW NW 17-7s-3e. IPF 2,530 M.c.f. of gas per day, 174 BDPD, 58° Basal Oil Creek sand 8,746-57 ft. TD 8,821 ft. New field.

Payne County: Russell Cobb, Jr., Inc., 1 Fruin, S½ SE NW 12-17n-1e. IPF 36 BOPD, 48°, Second Wilcox 4,935-41 ft. TD 4,941 ft. New pay in Coyle field.

Stephens County: Phillips 1 Jones, C NW NE 10-2n-4w. IPP 136 BOPD, 37.1°, Hart 9,241-60 ft. TD 9,440 ft. New field.

SOUTH LOUISIANA

Assumption Parish: North Central Oil Co. and Rowan Drilling Co. 1 Williams, 39-14s-14e. IP 211 BOPD, ⅛-in., 26.9°, GOR 1,440 cu. ft. per bbl., TP 1,425 psi., perforations 12,588-12,600 ft. TD 13,219 ft. (Second well, new pay, and first oil production in Oakley field.)

Plaquemines Parish: British-American Oil Producing Co. 1 Buras, 21-22s-30e (2 miles nortwest of West Bay field). Shut-in gas well, no gage, perforations 9,285-88 ft. and 9,278-80 ft. TD 11,540 ft. (New field, or long extension West Bay field.)

NORTH TEXAS

Cooke County: Burk Royalty Co. 2-A Wilson "D," Sullivan Sur., A-581, 6 mi. E Gainesville. IPP 136 BOPD, 42°, GOR 120, Strawn 2,737-52 ft. TD 4,203 ft.

Knox County: Fain & McGaha 2 Johnson, 100-45-H&TC, Upper Tannehill pay discovery in W. Goree field. IPP 51 BOPD, 34°, GOR 220, Upper Tannehill 1,822-28 ft. IP 65 BOPD, ¼-in., 34°, GOR 125, Lower Tannehill 1,901-02 ft. TD 2,115 ft.

SOUTHWEST TEXAS

McMullen County: Jupiter Oils, Inc., 2 South Texas Syndicate, Section 29, H&OB Sur., A-584. IP 8,000 M.c.f. daily (estimated open flow), dry gas, shut-in pressure 4,100 psi., perforations 10,530-51 ft. and 10,554-75 ft. (Edwards). TD 10,628 ft. New pay in previously abandoned Mula Pasture Wilcox field.)

Jim Wells County: Thomas Drilling Corp., et al 1 Stehle, H & GN Sur., A-227, Section 3 (19 miles north of Alice). IP 140 BOPD, P-33 choke, 44°, GOR 630 cu. ft. per bbl., perforations 5,175-83 ft. (Hockley). TD 6,079 ft. (New field—Stahle).

Tidewater Oil Co. 3 Freeborn Trustee, J. T. White Sur., A-529 (20 miles northwest of Alice). IP 2,580 M.c.f. daily, ¼-in., 26 BC per M.M.c.f., 62.6°, perforations 5,351-53 ft. (Pettus). TD 5,400 ft. (New field).

TEXAS GULF COAST

Montgomery County: Moran Corp. and others 1 Rosner & Anderson, James Edwards Sur., A-190 (5 miles northwest of Conroe). IP 4,200 M.c.f. daily, open-flow, GOR 250 M.c.f. per bbl., 32°, perforations 4,555-58 ft. (Cockfield). TD 8,537 ft. (New pay in Rosner-Anderson field.)

Nueces County: Ramada Oil & Gas Co. 1 Hoting, Branigar Brothers Subd. of Clarkson Ranch, Section 144 (1½ miles northwest of Shields field). Oil well (no gage), perforations 3,068-74 ft. TD 4,115 ft. (New field).

Arkansas Fuel Oil Corp. 2 State Tract 16, Corpus Christi Bay. IP 15,400 M.c.f. daily (absolute open flow), GLR 46.6 M.c.f. per bbl., 57.2°, perforations 7,971-80 ft. TD 8,760 ft. (New pay in Northwest Corpus Christi Channel field).

Wharton County: ACCO-D & E-Royal Oil & Gas Co. 1 Braden, J. S. Evans Sur.,

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HOUSTON, TEXAS

WECO Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

A-21 (14 miles southeast of Nada). IP 7,000 M.c.f. daily (absolute open flow), GLR 243 M.c.f. per bbl., 46°, perforations 4,548-53 ft. (Frio). TD 7,520 ft. (Discovery well of North New Taiton field—4 miles northwest of New Taiton field.)

F. A. Callery, Inc., and Kilroy Co. of Tex., Inc., 1 Gary et al, Stephen F. Austin Sur., A-2 (½ mile east of Boling on south flank of Boling dobe). IP 9,150 M.c.f. daily (absolute open flow), GLR 13.3 M.c.f. per bbl., 33.7°, perforations 6,743-52 ft. (Frio-Marginulina). TD 7,502 ft. (New pay on south flank of Boling dome).

WEST CENTRAL TEXAS

Erath County: Ralph Schneider 1 N. E. Whitfield, Robert Tyner Sur. 367, 5 mi. NW Dublin. IP 400,000 cu. ft. gas, open flow, shut-in TP 1,130 psi. TD 3,773 ft., PB 3,715 ft. Old well worked over.

Fisher County: George R. Brown 1 Kate Davenport, 127-3-H&TC, 5 mi. NW Claytonville. IPP 26 BOPD, 40°, GOR 810, Strawn reef 6,620-26 ft. TD 7,157 ft.

Jones County: Allison & Prestridge 2 Houston, Robertson, Subd. 29, Dewitt CSL 149, 3 mi. N Merkel. IP 35 BOPD, 12/64-in., 39°, GOR 923, TP 50 psi., Strawn sand 4,638-48 ft. TD 4,759 ft.

Drill Well Oil Co. et al 1 Floyd, R. Davidson Sur. 1, 4 mi. S Avoca. IPP 240 BOPD, 40°, GOR 500, King sand 2,179-94 ft. TD 2,194 ft.

Jones County: Fryer & Hanson Drilling Co. 1 Dillard, 53-18-T&P, 10 mi. SW Anson. IP 78 BOPD, 12/64-in., 40°, GOR 1340, TP 100 psi., Lower Cisco 3,788-3,814 ft. TD 4,102 ft.

Shackelford County: Jones & Stasney 1-G Dawson & Conway, Sec. 173, ETRR Sur., 14 mi. NW Albany. IPP 35 BOPD, 37°, pay 1,457-59 ft. TD 1,590 ft.

Throckmorton County: Pan American Petroleum Co. 2-B Matthews, Blk. 115, Comanche Indian Reservation, 10 mi. SW Throckmorton. IPP 34.5 BOPD, 44°, GOR 1323, Caddo 4,662-70 ft. TD 4,932 ft.

WEST TEXAS

Crane County: Evans Production Corp. 1 Dawson, 84-X-CCSD&RGNG, 10 mi. S Crane. IP 480 BOPD, 1-in., 38°, GOR 1975, TP 200 psi., Devonian 5,606-40 ft.

Gulf Oil Corp. 21 P. J. Lea, 47-32-PSL, 11 mi. W Crane. IP 155 BOPD, 16/64-in., 45°, GOR 712, CP 215 psi., Devonian perforations 6,126-6,200 ft.; IP 230 BOPD, 15/64-in., 40°, GOR 408, TP 210 psi., Connell perforations 8,468-88 ft. TD 8,370 ft.

Winkler County: Gulf Oil Corp. 181 Keystone Cattle Co., 29-B2-PSL, 6½ mi. E Kermit. IP 1,271 BOPD, ½-in., 33°, GOR 1098, TP 650 psi., Devonian perforations 8,640-80 ft. TD 9,998 ft.

Pan American Petroleum Corp. 27 Sealy Smith Foundation "A," 51-A-G&MM-B&A, Fusselman pay discovery in North Monahans field. IP 411 BOPD, 14/64-in., 37°, GOR 1390, TP 1400 psi., Fusselman 10,026-65 ft. IP 329 BOPD, 16/64-in., TP 870 psi., 41°, GOR 545, Ellenburger 12,060-12,110 ft. TD 12,573 ft.

Yoakum County: J. S. Abercrombie 1 J. C. Rogers, 751-D. J. H. Gibson Sur., 16 mi. SE Plains. IP 274 BOPD, ½-in., 35°, GOR 550, TP 100 psi., San Andres 5,544-74 ft. TD 13,561 ft.

In shifting top personnel . . .

. . . Humble Taps Reistle Again

WHEN Carl E. Reistle, Jr., decided on a career in oil he didn't realize he was helping to create a new profession. In a span of about three decades he has seen that profession—petroleum engineering—grow to maturity.

The Humble Oil & Refining Co. executive is willing to wager that "you couldn't find five men in the United States who would admit they were petroleum engineers" when he started out in the oil business.

To be technical about it, Reistle himself wasn't a petroleum engineer. He wanted to be one, but he didn't know how to go about it. In fact, he didn't even know the name of the embryo profession which he was about to join.

As a college student, Reistle worked during summer vacations as a roustabout in Hewitt field near Ardmore, Okla. It was then he learned the U. S. Bureau of Mines was preparing to make an engineering report on the field.

"My interest right from that day on was oil—how to get oil out of the ground," recalls the genial, cigar-chewing executive vice president of the nation's largest domestic crude producer.

In search of advice, young Reistle went to Ted Swigart, who has recently retired as president of Shell Pipe Line Corp. Swigart, whom Reistle considers "one of the greatest petroleum engineers of his day," told him he ought to go to Stanford University, one of the first schools to offer a course in petroleum engineering. That was out of the question for financial reasons. So, Swigart advised him to study chemical engineering plus geology.

This Reistle did at the University of Oklahoma, where he received his chemical-engineering degree in 1922.

After graduation, Reistle joined the Bureau of Mines. Among his first jobs was developing an easy way to determine the gravity of oil. Later, he helped in some of the first experiments on the solubility of gas in oil.

Spotted by Suman . . . As first field chairman of the East Texas Engineering Association, Reistle instituted reservoir studies which later led to the world's largest pressure-maintenance program.

Largely because of the young engineer's widespread reputation as a man with a future, John Suman, then Humble vice president, decided Reistle was "a pretty good guy to have in Humble Oil & Refining Co."

Reistle joined Humble in 1936 as engineer in charge of its petroleum-engineering division. Other company brass agreed with Suman's appraisal of Reistle. He moved up to head of the division in 1940, to manager of production in 1945, to director in 1948, and to vice president in 1955.

Last week, Reistle was named executive vice president of Humble.

In recent years Reistle has been a dominant factor in raising the stature of the petroleum engineer. He recently completed a year as president of the American Institute of Mining, Metallurgical and Petroleum Engineers. It was largely because of Reistle's leadership that the petroleum engineering branch this year was elevated in stature to the Society of Petroleum Engineers of A.I.M.E. The society now has nearly 11,000 members.

Philosophy . . . But, as far as Reistle is concerned, the petroleum engineer's greatest challenge—and greatest opportunity—lie ahead.

The nation's fuel supply in the future will be increasingly dependent on the petroleum engineer's skill.

The biggest challenge to all oil companies, Reistle believes, is in training its personnel. A company can buy all the equipment it needs, "but unless you have people that are well trained you can't hope for success."

Reistle's respect for engineering knowledge is shared by other top men in the company. No doubt it is responsible to a large degree for Humble's success.

For years the company has been diligently training some of its most promising men for better jobs. It started its own training program for reservoir petroleum engineers so far back that the company had to write its own textbook. Humble now offers a 9-month course for young engineers and a 2-month course for men with more experience.

What they learn in the laboratory they take back to the field. And that, according to Reistle, is one of the greatest advances in petroleum engineering since he joined the company. Reservoir work, formerly done almost entirely in the laboratory, now "has gone into the field."

Today, behind the unlit cigar stub protruding jauntily from the corner of his mouth, Reistle is still a scholar with an unquenchable thirst for knowledge. The cigar, incidentally, brings up the inevitable question, "Do you ever light that thing?" He replies with a chuckle, "No, I haven't smoked in years."

Morgan J. Davis, a former executive vice president of Humble Oil & Refin-

Personals

ing Co., has been elected president and chief executive officer. He succeeds **Hines H. Baker,** who recently had announced plans to retire. Two other directors of the company were advanced to positions of higher responsibility. **C. E. Reistle, Jr.,** (see above) was promoted from vice president in charge of production to executive vice president. **Ralph J. Schilthuis,** who has been director in charge of production, was named a vice president to succeed Reistle. **J. A. Neath** continues to serve as chairman of the board.

S. A. Berthiaume, assistant general manager of The Texas Co.'s domestic-producing department in Houston, has

G. H. CLARK

BERTHIAUME

been appointed assistant to the vice president in charge of the department and transferred to New York. Berthiaume has been with Texaco since 1940 and has been assistant general manager in Houston since 1954. **George H. Clark,** assistant South Texas division manager, producing department, has been transferred to Houston as assistant to the general manager, producing department. Clark will be succeeded as assistant South Texas manager by **O. B. Hocker,** head of the company's geophysical division.

A. E. Barroll, district production superintendent in southern Alberta for Mobil Oil of Canada, Ltd., has been named production superintendent for the company. **J. A. Worke** has been named to succeed Barroll as southern Alberta production superintendent, and **S. M. Thorne** has been appointed head of production activities in Edmonton. In other Mobil Oil appointments, **N. G. McCallum,** Swift Current, Sask., district superintendent, will head the company's new Pembina production district. **W. T. Archbold** will succeed McCallum in Swift Current. **P. K. Fleming,** field petroleum engineer in Pembina, has been named district petroleum engineer there. Two district geophysicists have been appointed by the company. They are **R. D. Jacques,** in Edmonton, and **M. McIver,** district geophysicist in Peace River.

K. T. McCamman, Shell Oil Co.'s division production superintendent in Ventura, Calif., has been named San Joaquin division production manager with headquarters in Bakersfield, Calif.

Bill A. Street, Pubco Petroleum Corp. district geologist and superintendent, has been transferred to Casper, Wyo., from Denver.

Gordon D. Kerns, assistant project chemical engineer at the Whiting, Ind., research laboratory of Standard Oil Co. (Ind.), has been named manufacturing coordinator with Amoco Chemicals Corp. in Chicago.

Dr. M. W. Tamele, associate director of Shell Development Co.'s Emeryville, Calif., research center, has been assigned to Shell Research Laboratories in Amsterdam where he will assist the director of research in planning and directing the use of fundamental physico-chemical research. Tamele has been with Shell since 1929.

Robert L. Augenthaler, central division exploration superintendent at San Angelo, Tex., for Standard Oil Co. of Texas, has been named assistant to the vice president of California Exploration Co., San Francisco. California Exploration, like Standard of Texas, is a subsidiary of Standard Oil Co. of California.

Ralph D. Copley, The California Co.; **H. B. Gernert,** Trigood Oil Co.; and **R. L. Armstrong,** Oil Well Supply Co., were awarded citations for service at the recent Rocky Mountain district meeting of the American Petroleum Institute's Division of Production. The citations recognize outstanding contributions to the industry and the A.P.I.

John W. House has resigned as superintendent of Humble Oil & Refining Co.'s western division production department at Midland, Tex. **Larry H. Byrd,** assistant production superintendent, has been named to succeed House temporarily. House had served as production superintendent of the firm's western division since 1938.

Edwin Carlson, party chief for Northern Natural Gas Co. in Lincoln, Neb., has been named division engineer in Bushton, Kans. **Arthur Kracke,** Hugoton, Kans., party chief, has been transferred to Skellytown, Tex., as division engineer, and **Walter Martin,** party chief in Hobbs, N. M., has been appointed division engineer there. **Robert Stumbo,** party chief, has been transferred to Ogden, Iowa, from Ventura, Iowa.

William K. Warren, chairman of the board and chief executive officer of Warren Petroleum Corp. and a director of Gulf Oil Corp., has been elected president of the International Petroleum Exposition in Tulsa. Warren succeeds the late W. G. Skelly, who had been president of the exposition for over 30 years. Warren has been on the I.P.E. executive committee since 1952 and has been a director for more than 20 years. The next exposition is scheduled in Tulsa May 14 to 23, 1959.

Ole Berg, Jr., formerly president of American Oil Co., Ltd., and British-American Oil Producing Co., has been named chairman of the board and managing petroleum director of Stanwell Oil & Gas, Ltd., Toronto.

John S. Ivy, Houston consulting geologist and petroleum engineer, has been elected to the board of Texas Eastern Transmission Corp. Ivy succeeds **George T. Naff,** vice chairman of the board, who has retired.

Edel F. Blanks has been named president of Olin Gas Transmission Corp., subsidiary of Olin Oil & Gas Corp. Blanks, vice president and a director of the company since 1948, succeeds **Harold F. Moses.** Moses has been elected chairman of the board. Blanks joined the company in 1926.

Joseph D. Harnett, manager of the transportation department of Standard Oil Co. (Ohio), has been elected vice president for transportation. Harnett joined Sohio in 1941. He was general superintendent of pipeline operations before being named manager of the transportation department in 1954.

Robert S. MacAlister, Jr., has been appointed division development engineer at Shell Oil Co.'s new Farmington, N. M. production division office. MacAlister was formerly at the company's Los Angeles office. **Donald L. Jacobsen** has been transferred from the Los Angeles Basin to Farmington as head of the mechanical department. **Joseph E. Dozier, Jr.,** and **Walter D. Larrick,** both formerly of the Los Angels office, have transferred to the new division as production superintendents of the Paradox and San Juan districts.

Personals

G. T. TENNISON

George T. Tennison, Shell Oil Co., Houston, has been elected president of the Natural Gasoline Association of America. Tennison succeeds **Albert H. Weil,** United Gas Pipe Line Co. Elected N.G.A.A. vice presidents were **Warren H. Kraft,** Honolulu Oil Corp., San Francisco; **A. L. Vaughan,** Northern Natural Gas Co., Omaha; **Charles E. Webber,** Sun Oil Co., Philadelphia; and **Ralph Worley,** Parade Co., Shreveport. Directors of the association elected for 3-year terms are Kraft; **M. F. Wirges,** Arkansas Fuel Oil Corp.; **Frank M. Perry,** Cities Service Oil Co.; **C. L. Ritter,** Continental Oil Co.; **Harry A. Ellis,** Gasoline Plant Management Co.; **C. T. Wells, Jr.,** Goliad Corp.; **J. R. McChesney,** Pure Oil Co.; **Dewey J. Sabin,** Sohio Petroleum Co.; **Max L. Riley,** Southwest Gas Producing Co.; and **W. V. Vietti,** The Texas Co.. Appointed directors for a 1-year term are **Albert Taylor,** Amerada Petroleum Corp.; **G. W. McCullough,** Phillips Petroleum Co.; and Weil.

J. H. Renard, Sinclair Pipe Line Co., and **A. W. Tarkington,** Continental Oil Co., have been elected to the board of Platte Pipe Line Co. Renard succeeds **J. D. McConnell,** Sinclair; and Tarkington replaces **T. A. van Griethuysen,** Continental.

John O. Hills has been named assistant to the director of production for General Petroleum Corp. in Los Angeles. **Charles F. Gates,** chief production engineer, succeeds Hills as assistant manager of the production engineering and equipment section.

George Goodin, Petroleum Information, Casper, Wyo., has been elected chairman of the Rocky Mountain district of the American Petroleum Institute's Division of Production. Goodin succeeds **Wayne E. Glenn,** Continental Oil Co., who has been appointed chairman of the district advisory committee. **Ernie Howell,** Northern Mud Co., is new secretary-treasurer. Elected district vice chairmen are **Claude E. Peavy,** Britalta Petroleums, Ltd., vice chairman for Canada; **J. J. Oldham,** R. L. Manning Co., Wyoming; **Hugh Palmer,** Cardinal Drilling Co., North Dakota; **O. L. Odale,** Shell Oil Co., Colorado; **L. A. Lindstrom,** Ohio Oil Co., Nebraska; **Auby Rowe, Jr.,** McAlester Fuel Co., Montana; and **Warren L. Taylor,** El Paso Natural Gas Co., Utah.

C. D. Prater has been promoted to research associate at Socony Mobil Oil Co.'s Paulsboro, N. J., research and development laboratory.

A. M. Smith, production engineer with John W. Mecom, has been transferred to Sulphur, La., from Houma, La.

John W. Mathews, Richfield Oil Corp.'s chief geophysicist, has been transferred to Los Angeles from Bakersfield, Calif.

Walter Greenfield, head of Signal Oil & Gas Co.'s joint-venture operations since 1955, and manager of the company's crude-oil department before that time, has retired. Greenfield joined Seaward Oil Co., a Signal subsidiary, in 1932.

T. A. Dent, administrative superintendent of Burmah - Shell Refineries, Ltd., Bombay, has been appointed manager of the Clyde refinery of Shell Oil Co. of Australia, Ltd. Dent succeeds **A. E. Risson,** who was recently named general manager and managing director of Burmah - Shell Refineries, and transferred to India from Australia.

William Wallace Mein, Jr., president of Canadian Bishop Oil, Ltd., and its parent company, Bishop Oil Co., has been elected chairman of the board of Canadian Bishop. **Louis J. Brunel** moves up to president of the subsidiary, succeeding Mein. Brunel was formerly vice president. **Donald I. Lawless,** exploration manager, has been named vice president in charge of operations, and **Rex Barnes** has been appointed division manager and director.

T. L. Kunkel has been promoted by The Texas Co. from assistant manager of the geophysical division to chief geophysicist, producing department. Kunkel has been with Texaco since 1934. He had been assistant manager of the geophysical division since 1955.

D. Glen Morgan, director of research and development for D-X Sunray Oil Co., has retired after 40 years with the company and its predecessors. Morgan joined Cosden Oil & Refining Co., one of the forerunners of D-X Sunray, in 1917. He was general superintendent and general manager of the company's Tulsa refinery before becoming research director in 1945.

James R. Crow, Tidewater Oil Co. geologist, has been transferred to New Orleans from Lafayette, La.

L. E. Bidwell, Jr., petroleum engineer with Sohio Petroleum Co., has transferred to Centralia, Ill., from Lafayette, La.

Dolphe E. Simic has resigned as exploration manager of Frankfort Oil Co. Simic was an independent operator in Denver before joining Frankfort late last year. He was exploration manager and vice president of Bay Petroleum Corp. before that time.

H. D. HEDBERG

Hollis D. Hedberg, exploration coordinator for Gulf Oil Corp., has been named vice president in charge of exploration. **Archie D. Gray,** general counsel, has been appointed vice president and general counsel. Hedberg joined Gulf in 1928. He was exploration manager of the company's foreign production division before being named exploration coordinator in 1953. Gray has been with Gulf since 1935. He was Texas assistant attorney general in charge of oil and gas matters at one time.

Robert W. Ramsdell, executive vice president of East Ohio Gas Co. since 1956, has been elected president. Ramsdell succeeds **William G. Rogers,** who has been named chairman of the board. Rogers had been East Ohio president since 1951. He will continue as a director of the parent company, Consolidated Natural Gas Co. Ramsdell joined East Ohio in 1928. He was general manager and then vice president before being named executive vice president.

Six oil men have been appointed by the Interior Department to the Military Petroleum Advisory Board, bringing total board membership to 28. The new members are **Charles P. Baker,** Mobil Overseas Oil Co., Inc., New York; **Walter E. Caine,** Texas Eastern Transmission Corp., Shreveport; **Albert R. Denison,** Amerada Petroleum Corp., Tulsa; **Jake L. Hamon,** Dallas independent; **Herschel Hyde,** Tidewater Oil Co., San Francisco; and **Frank A. Watts,** Humble Oil & Refining Co., Houston.

Personals

Lee A. Whitney, Champlin Oil & Refining Co.'s vice president in charge of refining, has been named vice president and coordinator of manufacturing and marketing for the company.

L. A. WHITNEY

E. M. BEEBE

Earl M. Beebe, manager of Champlin's Enid, Okla., refinery, has been transferred to Fort Worth as manager of refining. **J. E. Mohundro,** process engineer, has been named superintendent of the Enid refinery.

O. L. Furse, assistant division superintendent of Humble Oil & Refining Co.'s East Texas production department at Tyler, Tex., has been promoted to superintendent of the eastern division production department with headquarters at New Orleans. Furse has been with Humble since 1933.

C. K. Whitney has joined Amoco Chemicals Corp. in Brownsville, Tex., as senior engineer. He was formerly job engineer with Refinery Engineering Co. in Tulsa.

Rex Hafer, geologist with Tidewater Oil Co., has been transferred to Casper, Wyo., from Billings, Mont. **Howard Speer,** geologist, has been transferred to Midland, Tex., from Billings.

Jesse J. Smith, connection foreman in Mechanicsburg, Pa., with Sinclair Pipe Line Co., has been transferred to Toledo in the same capacity.

Emmett J. Berg, formerly with Great American Oil Co., has joined Kerr-McGee Oil Industries, Inc., as planning and design engineer.

Kenneth J. Smith, Sinclair Oil & Gas Co.'s assistant district foreman at Velma, Okla., has been promoted to district foreman in Oxford, Kans.

J. D. Bland, acting supervisor of Texas Eastern Transmission Corp.'s products division, engineering department, has been promoted to general superintendent of the petroleum-products division. Bland was chief engineer of Triangle Pipeline Co. when it was merged with Texas Eastern in 1955.

Texsteam MSM 5001 diaphragm-operated chemical pump

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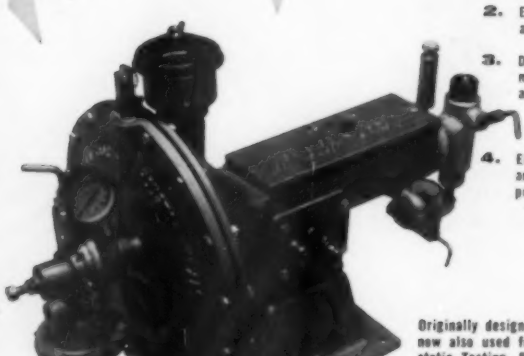
1. Simplicity of Design—makes repairs by non-technical personnel possible.
2. Ease of Operation—saves operators valuable time.
3. Dependable Accuracy—means more hours of operation without adjustment.
4. Economy in Both Initial Cost and Operation—means less cost per unit of work.



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Ernest Szabo, geologist with Sinclair Oil & Gas Co. in Denver, has been transferred to Albuquerque.

Fred Bennett, geologist with Phillips Petroleum Co., has been transferred to Wichita from Evansville, Ind.

J. M. Ogden, Wichita independent, has joined the Kansas Corporation Commission as director of conservation. He succeeds **C. C. Linley.**

J. N. Waddell, Henry H. Cross Co., has been elected 1957 chairman of the American Society of Lubrication Engineers. **E. W. Drummond,** International Harvester Co., is new vice chairman, with **G. S. Metcalfe,** Farval Corp., secretary-treasurer; and **Dr. A. B. Wilder,** E. I. du Pont de Nemours Co., director.

D. G. Price, head of the Regina production office of Mobil Oil of Canada, Ltd., and **A. A. Halkers,** field superintendent there, have been transferred with their staff to Weyburn, Sask. The move will switch Saskatchewan and Manitoba production headquarters of the company from Regina to Weyburn.

Dr. Hans Theel has been named a vice president of Esso A.G., West German affiliate of Standard Oil Co. (N. J.). He succeeds **A. Spangenberg,** who has retired. Dr. Theel joined Esso A.G.'s predecessor company in Germany in 1931. One of his prime responsibilities has been rebuilding the company's refining position since World War II.

O. D. Thomas has been promoted to foreign-exploration director in Phillips Petroleum Co.'s foreign department. Thomas was formerly southwest regional geologist for the company in Bartlesville, Okla. **J. R. Leonard,** division exploration geologist at Amarillo, Tex., will succeed Thomas in Bartlesville. Thomas has been with Phillips since 1948 and has been southwest regional geologist since last year. Leonard joined Phillips in 1947.

DEATHS

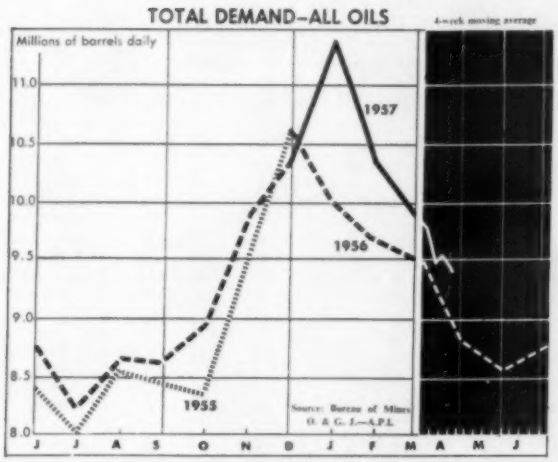
Glen Hatch, 54, former vice president of the old Roosevelt Oil & Refining Corp., Mount Pleasant, Mich., and former president of Ajax Drilling Co., Clare, Mich., died April 21.

Ludwig Zerzog, 68, well-known German refiner and owner of J.O.G. Mineraloel-Raffinerie at Ottobrunn near Munich, died last month after a long illness.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,541,475	DOWN	35,600	UP	408,946
Crude stocks	257,081,000	UP	1,765,000	DOWN	13,627,000
Completions	976	DOWN	27	DOWN	167
Refinery runs	7,634,000	DOWN	56,000	UP	187,000
Gasoline stocks	200,222,000	DOWN	1,723,000	UP	10,034,000
Kerosine stocks	20,163,000	UP	384,000	UP	2,269,000
Distillate stocks	74,898,000	UP	2,097,000	UP	12,975,000
Residual stocks	36,800,000	DOWN	143,000	UP	4,324,000
Four-product stocks	332,083,000	UP	615,000	UP	29,602,000



Domestic Demand Was Up Only About 3.3 Per Cent in First Quarter

ABNORMAL exports in the first quarter of this year, resulting from the disturbance in the Middle East, have tended to hide the fact that domestic demand has not shown a normal gain over last year.

The Monthly Petroleum Statement for February has just been released by the Bureau of Mines. Actual demand figures for the first 2 months can be combined with estimates for March, based on weekly reports, to give reasonably close estimates for the first quarter.

The Supply and Demand Committee of the Independent Petroleum Association of America released its revised forecast for the year at the midyear meeting at Biloxi, Miss., on April 29.

Using actual demand figures from the Bureau of Mines and weekly estimates for March, the committee reported total demand for the first quarter at 10,713,000 bbl. daily. Increased shipments to Europe in March raised total exports for the quarter to 935,000 bbl. daily.

Domestic demand averaged about 9,778,000 bbl. daily or a little less than 3.3 per cent more than for the first quarter of 1956. Published forecasts for 1957, made in the latter part of 1956, showed the following expected increases in the first quarter: Bureau of Mines, 4.6 per cent; I.P.A.A., 4.9 per cent; and The Oil and Gas Journal, 4.0 per cent.

All of these forecasts made some allowance for the fact that the winter of 1955-56 was colder than normal. The past winter was warmer than normal. The over-all result was a very small gain in domestic demand for middle distillate, amounting to about 1.2 per cent. The Bureau of Mines forecast a gain of about 6.5 per cent in domestic demand for middle distillate in the first quarter, and the Journal's forecast called for an increase of 4.6 per cent. However, both of these projections were based on normal or near-normal weather.

Increases in total domestic demand varied by months in the first quarter. January demand was 8.3 per cent above January 1956, but February dropped to a gain of only 0.2 per cent. March was not much better with an increase of 0.9 per cent over March last year.

The revised forecast by the Supply and Demand Committee of I.P.A.A. carries lower estimates for domestic demand than in the original forecast made by the committee last October. The committee now expects domestic demand to average 9,179,000 bbl. daily compared with the original forecast of 9,320,000 bbl. daily. Reductions were made in estimates for each quarter of the year.

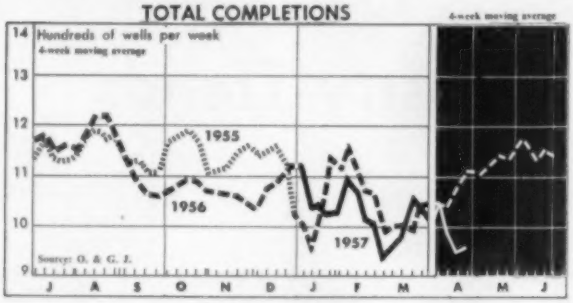
Other forecasts of domestic demand made late last year include: an estimate of 9,289,000 bbl. daily by the Bureau of Mines, and 9,293,000 bbl. daily by The Oil and Gas Journal.

Summer refill programs start . . . Esso Standard Oil Co., announced that it is extending price protection to resellers of No. 2 fuel and kerosine. No discount off postings is offered. The program will protect resellers against a declining market from the date of delivery to September 30.

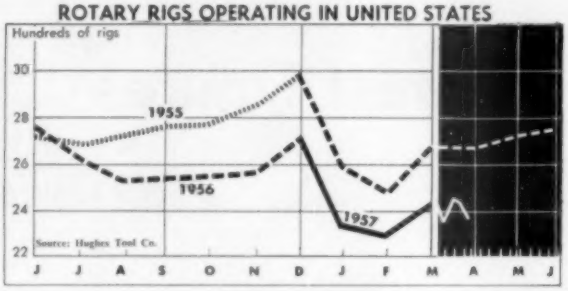
The program also calls for delayed billing to October 1. Other companies are expected to announce plans for summer-fill programs during the first half of this month.

Esso also cut residual prices during the last week of April.

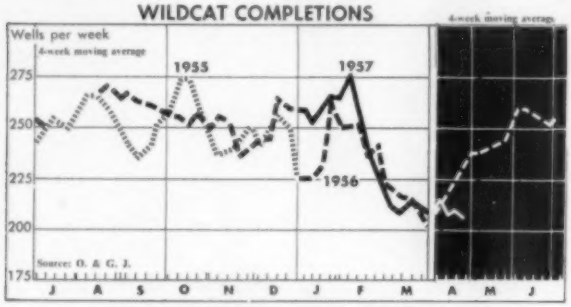
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	4-29-57	4-22-57	4-30-56
North Central and East	85	83	108
Southeast	47	41	32
Okla., Kans., Ark., Mo.	414	431	487
Louisiana	420	418	489
North and East Texas-Panhandle	378	405	444
Gulf and South Texas	192	230	204
West Texas-New Mexico	514	537	534
Rocky Mountain	231	200	238
Pacific Coast	91	87	135
Total United States	2,372	2,432	2,671
Canada	103	99	96

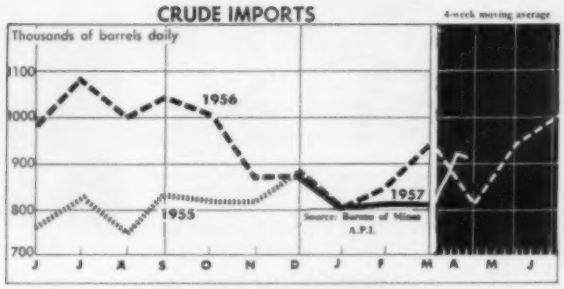
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 27, 1957

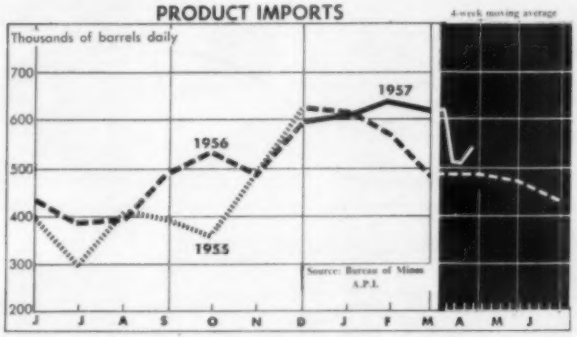
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1957				
	Comp.	Oil	Gas	Dry	Footage	1957	1956	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	†1	1	0	0	11,457	35	32	0	0	0	0	0	0	0	1	13	14
Arkansas	22	13	2	7	77,328	319	245	1	0	1	4	6	6	0	2	42	50
California	38	29	1	8	183,104	634	696	3	0	0	8	11	17	0	2	145	164
Colorado	13	3	3	7	72,071	302	361	1	0	0	4	5	12	0	4	186	202
Illinois	29	15	0	14	70,171	756	1,094	2	0	0	4	6	9	0	1	174	184
Indiana	11	6	0	5	18,567	199	192	1	0	0	0	1	4	0	0	38	42
Kansas	61	30	4	27	234,300	1,364	1,624	3	0	0	14	17	41	0	8	211	260
Kentucky	9	5	0	4	16,266	449	527	0	0	0	1	1	11	0	3	82	96
Louisiana	81	33	8	40	724,922	1,220	1,227	1	0	1	16	18	28	9	29	150	216
North	23	11	1	11	112,949	423	466	0	0	0	2	2	3	0	2	41	46
South	41	10	6	25	455,819	564	608	1	0	1	12	14	18	8	21	93	140
Offshore	17	12	1	4	156,154	233	153	0	0	0	2	2	7	1	6	16	30
Michigan	7	5	0	2	18,883	124	152	0	0	0	2	2	4	0	0	51	55
Mississippi	5	2	0	3	35,165	113	140	0	0	0	2	2	7	0	0	44	51
Montana	4	2	0	2	20,391	98	103	0	0	0	1	1	2	0	0	31	33
Nebraska	5	1	0	4	31,954	246	307	0	0	0	3	3	14	0	0	119	133
New Mexico	35	22	8	5	170,254	639	583	2	0	0	2	4	26	1	5	68	100
Northwest	11	2	8	1	48,951	235	208	0	0	0	1	1	12	1	4	23	40
Southeast	24	20	0	4	121,303	404	375	2	0	0	1	3	14	0	1	45	60
New York	9	4	0	‡5	9,250	149	.....	0	0	0	0	0	0	0	0	0	0
North Dakota	4	4	0	0	34,416	94	73	1	0	0	0	1	5	0	0	30	35
Ohio	14	6	4	§4	37,465	331	346	0	0	0	0	0	0	0	0	3	3
Oklahoma	117	75	1	¶41	385,113	2,166	2,851	2	0	0	7	9	35	7	6	195	243
Pennsylvania	1	0	1	0	7,824	322	*303	0	0	1	0	1	0	0	12	18	20
Texas	473	304	23	146	1,882,642	7,037	6,994	11	4	3	81	99	211	20	72	1,541	1,844
Southwest (1 & 4)	71	39	5	27	255,432	864	1,034	1	2	1	18	22	30	6	21	258	315
Gulf Coast (2 & 3)	42	17	2	23	308,029	814	884	0	2	1	17	20	16	10	37	224	287
East (5 & 6)	36	17	4	15	167,244	413	355	0	0	0	9	9	4	0	2	123	129
N. Central (7-B & 9)	155	83	2	70	405,097	2,516	2,462	9	0	0	31	40	112	0	5	660	777
West (7-C & 8)	141	125	7	9	637,272	1,996	1,889	1	0	1	6	8	46	0	6	252	304
Panhandle (7-D)	28	23	3	2	109,568	434	370	0	0	0	0	0	3	4	1	24	32
Utah	6	4	0	2	35,730	55	27	1	0	0	2	3	5	0	2	27	34
West Virginia	11	3	7	1	26,174	207	226	0	0	0	0	0	0	0	7	2	9
Wyoming	19	12	0	7	83,671	255	236	0	0	0	6	6	10	0	2	80	92
Miscellaneous (S. D.)	1	0	0	1	5,777	25	51	0	0	0	1	1	0	0	1	19	20
Total United States	**976**	579	62	335	4,192,895	17,139	18,390	29	4	6	158	**197**	447	37	157	3,269	3,910
Total previous week	1,003	555	57	391	4,187,034	.....	.....	24	4	6	177	211	418	33	151	3,111	3,713
Total April 28, 1956	1,143	621	66	456	4,474,824	.....	.....	29	4	6	203	242	506	58	115	3,349	4,028
Cum. 1957	17,139	9,174	1,260	6,705	71,120,715	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Western Canada	27	10	0	17	114,916	832	787	1	0	0	4	5	20	0	17	192	229

*Incl. N. Y. †Ala. Service wells included: ‡5, §3, ¶13.

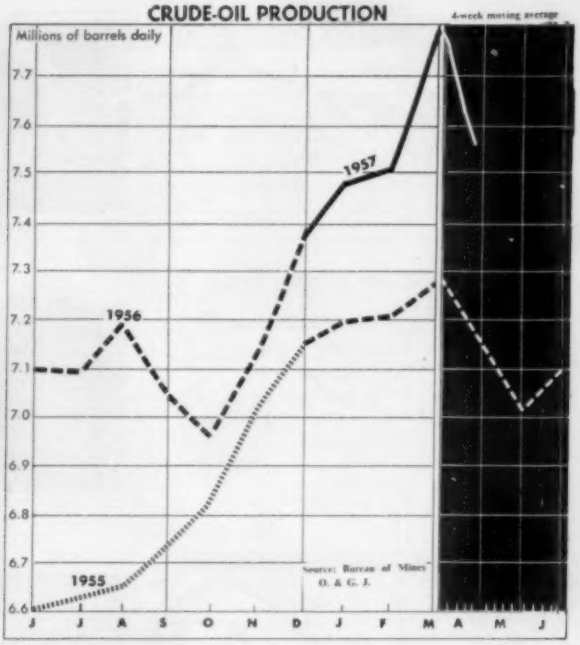
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION



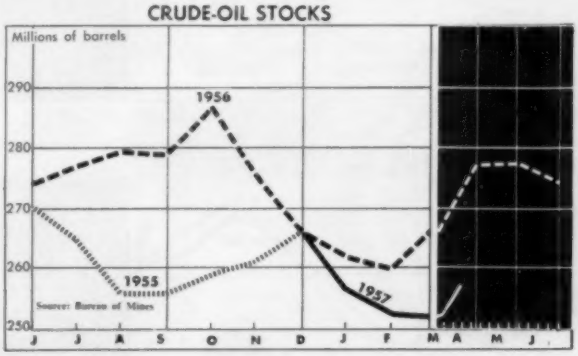
DAILY AVERAGE PRODUCTION FOR WEEK

	April, 27, 1957			Apr. 20
	Crude oil	Lease condensate	Total	total
Alabama	11,850	.....	11,850	11,825
Arkansas	83,300	300	83,600	83,625
California	929,200	.....	929,200	930,000
Colorado	157,800	.....	157,800	153,200
Eastern	50,600	.....	50,600	50,200
Florida	1,225	.....	1,225	1,225
Illinois	228,300	.....	228,300	229,400
Indiana	32,300	.....	32,300	31,100
Kansas	†346,100	.....	†346,100	†351,000
Kentucky	47,100	.....	47,100	47,700
Louisiana	877,800	74,400	952,200	952,400
North	128,800	2,900	131,700	131,900
South	749,000	71,500	820,500	820,500
Michigan	28,200	.....	28,200	28,500
Mississippi	110,050	4,900	114,950	114,950
Montana	72,750	.....	72,750	72,950
Nebraska	53,500	.....	53,500	53,650
Nevada	100	.....	100	100
New Mexico	269,200	5,200	274,400	274,400
North Dakota	29,450	.....	29,450	37,650
Oklahoma	†622,500	.....	†622,500	†634,400
Texas	3,150,000	55,250	3,205,250	3,205,250
Dist. 1	56,000	475	56,475	56,475
Dist. 2	155,000	8,750	163,750	163,750
Dist. 3	444,000	26,300	470,300	470,300
Dist. 4	245,000	6,600	251,600	251,600
Dist. 5	42,000	400	42,400	42,400
Dist. 6	140,000	6,000	146,000	146,000
East Texas Field	210,500	.....	210,500	210,500
Dist. 7-B	168,000	75	168,075	168,075
Dist. 7-C	171,000	4,225	175,225	175,225
Dist. 8	1,195,000	1,400	1,196,400	1,196,400
Dist. 9	214,000	700	214,700	214,700
Dist. 10	109,500	325	109,825	109,825
Utah	11,450	.....	11,450	13,150
Wyoming	288,550	.....	288,550	300,300
Others	‡100	.....	‡100	‡100
Total U. S.	7,401,425	140,050	**7,541,475**	7,577,075
Change from prev. week, down			**35,600**	.....
Canada	†549,300	.....	†549,300	†563,000

Total U. S. production—January 1-April 27 ..... 887,210,700 bbl.
Same period last year (plus cond.) ..... *850,941,104 bbl.

*Includes 15,391,530 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

CRUDE-OIL STOCKS



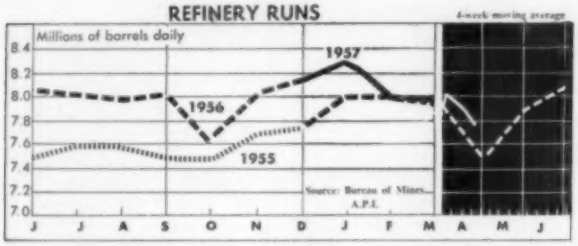
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

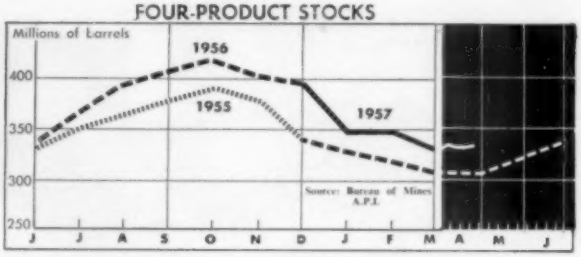
	4-20-57	4-13-57	4-21-56
Pennsylvania Grade	2,696	2,642	2,644
Other Appalachian	1,890	1,890	2,378
Illinois, Indiana, Michigan	9,276	9,134	10,006
Nebraska, North Dakota	1,894	2,106	2,050
Kansas	8,966	8,602	8,374
Oklahoma	22,437	22,405	24,860
Arkansas	2,753	2,561	2,689
Louisiana	17,877	18,527	17,431
North	2,828	2,826	2,557
South	15,049	15,701	14,874
Mississippi	2,225	2,257	3,032
New Mexico	7,204	7,277	8,050
Texas	118,521	116,130	126,202
East Texas proper	10,822	10,969	8,964
West Texas	55,606	53,580	63,526
Texas Gulf	21,713	22,047	21,880
Other Texas	30,380	29,534	31,832
Wyoming	16,689	16,223	16,511
Other Rocky Mountain	6,330	6,069	6,056
California	25,578	25,995	28,200
Foreign	†12,745	13,498	12,225
Total	257,081	255,316	270,708

*Bureau of Mines. †Includes 3,228,000 bbl. in California.

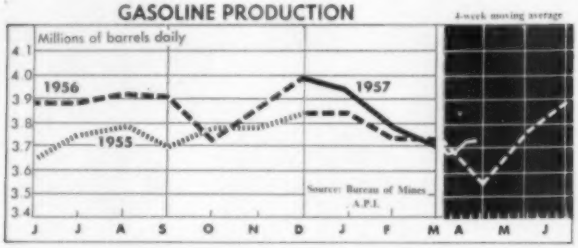
REFINERY RUNS



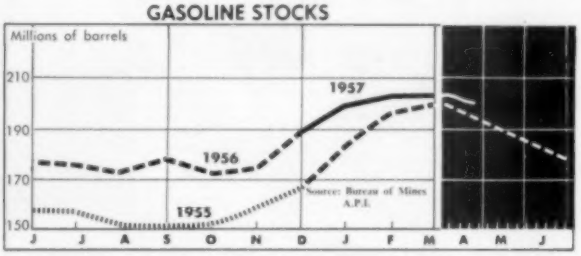
FOUR-PRODUCT STOCKS



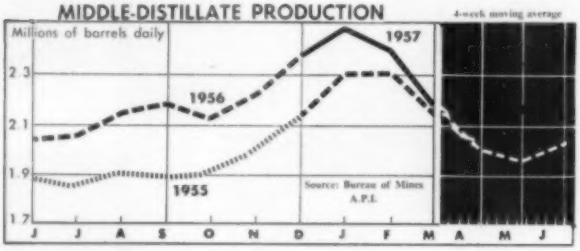
GASOLINE PRODUCTION



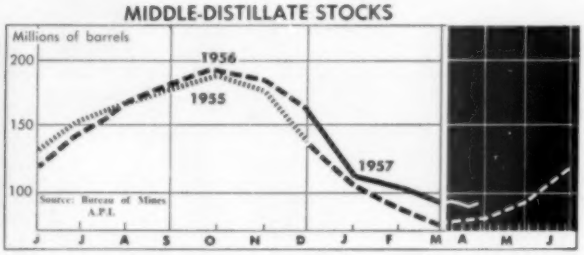
GASOLINE STOCKS



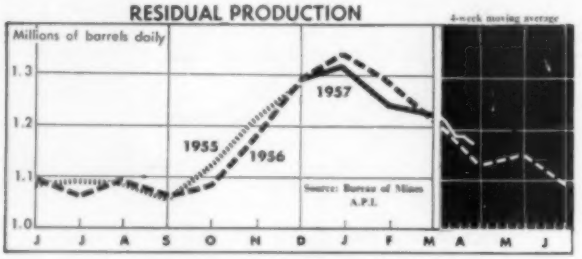
MIDDLE-DISTILLATE PRODUCTION



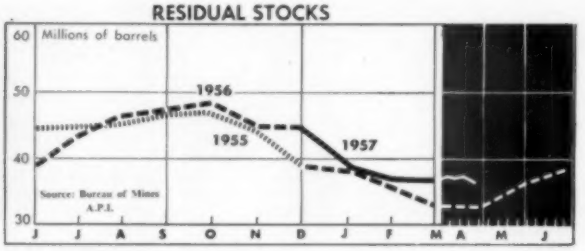
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, APRIL 26, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production — Gaso.*	Kero.	Dist.	Resid.	Stocks‡ — Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, April 1956 — Daily avg. runs	Daily average production — Gaso.*	Kero.	Dist.	Resid.
East Coast	1,171	511.9	24.8	295.3	214.8	42,844	8,459	22,915	8,665	1,027	417.0	30.2	285.3	196.1
Appalachian:														
District 1	101	42.1	4.4	20.0	8.3	5,102	455	1,889	486	94	36.5	4.3	21.5	6.3
District 2	113	50.3	5.4	14.9	16.9	2,799	392	541	355	100	48.7	6.4	15.7	14.0
Ind., Ill., Ky.	1,280	686.4	64.6	276.4	174.6	37,698	3,510	11,144	4,818	1,333	674.4	77.0	257.8	172.0
Minn., Wis., Dak.	72	36.0	8.3	19.6	5.4	6,654	326	3,155	392	80	37.3	3.7	20.9	5.8
Okla., Kans., Mo.	573	335.1	17.4	122.9	34.4	19,978	928	6,999	872	604	307.5	12.4	141.6	29.5
Inland Texas	254	189.9	3.9	54.7	20.3	7,855	275	1,447	1,699	246	185.2	9.2	46.3	28.3
Texas Gulf Coast	1,947	875.6	51.1	504.4	236.1	26,415	2,629	8,642	5,010	1,958	925.0	93.8	523.8	244.8
La. Gulf Coast	687	364.3	49.7	191.4	56.6	11,126	2,006	4,470	1,412	678	337.1	52.1	161.7	47.8
N. La. and Ark.	59	29.0	3.6	16.2	5.6	4,446	623	1,745	104	60	20.4	1.9	17.8	2.5
Rocky Mountain:														
New Mexico	28	13.4	0.6	5.1	3.6	388	11	90	63	24	12.9	0.3	4.3	3.0
Other Rocky Mtn.	241	115.7	1.6	57.6	37.4	7,924	234	2,422	957	227	103.2	2.2	55.5	32.0
California	1,108	494.7	0.0	186.1	377.3	26,993	315	9,439	11,967	1,056	452.1	5.6	160.7	347.6
April 26, 1957	7,634	3,744.4	235.4	1,764.6	1,191.3	200,222	20,163	74,898	36,800	7,487	3,557.3	299.1	1,712.9	1,129.7
April 19, 1957	7,690	3,767.1	308.0	1,641.7	1,192.1	201,945	19,779	72,801	36,943	.....	.....	.....	.....	.....
April 27, 1956	7,447	3,557.7	315.0	1,695.3	1,122.6	190,188	17,894	61,923	32,476	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	11.75-12.25
Premium (96 octane)	13.50-14.00
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	13.00-13.50
Premium (98 octane)	13.25-13.75
California (rack):	
Regular (86 octane)	13.1
★ Premium (93 octane)	15.3
★ Premium (96 octane)	16.2
Caribbean area (cargoes):	
Regular (87 octane)	11.00
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
★ Grade 26-70	3.5-4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	10.00-10.375
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	9.00-9.375
Gulf Coast (cargoes):	
Kerosine 41-43	10.50-11.00
Distillate No. 2	10.00-10.50
New York Harbor (barges):	
Kerosine 41-43	12.25
Distillate No. 2	11.65
Diesel fuel, 48-52 d.i.	11.95
Caribbean area (cargoes):	
Distillate No. 2	10.00

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid) in bags or barrels	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max 1% S)	$2.25-2.35
Gulf Coast (cargoes):	
Bunker C fuel	$2.75-3.00
New York Harbor (barges):	
★ Bunker C fuel	$3.20
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.85-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex. & N.M. (sour)	Wyo. (sour)
14-14.9	$2.67				
15-15.9	2.71				$1.89
16-16.9	2.74				1.94
17-17.9	2.78				1.99
18-18.9	2.82				2.04
19-19.9	2.85				2.09
20-20.9	2.89	$2.75		$2.62	2.14
21-21.9	2.93	2.77		2.64	2.19
22-22.9	2.97	2.79		2.66	2.24
23-23.9	3.01	2.81	$3.44	2.68	2.29
24-24.9	3.05	2.83	3.46	2.70	2.34
25-25.9	3.09	2.85	3.48	2.72	2.39
26-26.9	3.13	2.87	3.50	2.74	2.44
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low Cold test Gulf Coast. ‡Sour.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, January 16, 1957.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.88
Middle District	4.70
Southwest Pennsylvania	4.41
West Virginia	4.23
Buckeye Grade	4.23
Zanesville Grade	3.27
Illinois Basin	**3.15**
Canada:	
Leduc-Woodbend	2.78
Redwater (Alta.)	2.67
Smiley (Sask.)	2.44
Pembina	2.65

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 40°-40.9°, Puerto La Cruz	3.37
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.69
Iraq, 36.0°-36.9°, Tripoli, Banias	2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC—20%)	$2.28
★ N.W.I.-U.S.N.H., dirty (USMC—35%)	1.76
★ Gulf-France, dirty (USMC—25%)	5.74
★ P.G.-U.S.N.H., dirty (USMC—17.5%)	10.48

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INTERESTED IN THE CUBAN PLAY? Earn 50% interest in a Cuban corporation by drilling 20,000 ft. of holes in a 40,000 acres tract in the Pinar del Rio Province with good geology. One major company is scheduled to drill 6 deep holes this year in adjoining areas. Write to: M. A. Noguera, Aguiar 574 St. Havana, Cuba.

WANTED PARTIES to join me in drilling 80 acres, northwest extension of Livingston pool drilled in North half of Section 16-17-15 where wells came for 600 barrels per day. Close to the Big play in the Arbuckle pay, first well reported 1,000 barrels per day. Good chance to get in on a Big Play. ¾ interest $6,000.00, ½ interest $4,000.00, ¼ interest $2,000.00, ⅛ interest $1,000.00. ¼ interest $500.00, ½ interest $250.00. Reduction in cost per interest if production is found above Mississippi Lime. If interested I will send you Map and printed Sheet discussing the lessibilities of lease. Only a ¼ left. Write O. A. Sewell, P. O. Box 103, Coweta, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties from acquisition to production. No properties too small, none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited. Write, wire or call collect for further information.

MAKIN DRILLING COMPANY
P. O. Box 1628
Hobbs, New Mexico
Phone: EXpress 3-3141

WANTED

NEED GOOD PROVEN development or producing property up to several million dollars valuation. Reply with geological, engineering reports, records. W. D. Pye, Box 2586, Fargo, N. D.

WANTED—Semi-proven or proven leases or farmouts in South Texas or Gulf Coast. Please send complete details in first letter. P. O. Box 1937, San Antonio, Texas.

GEOPHYSICIST seeks sponsor or financial backing for an entirely different method of locating probable oil fields. Fast, economical, practical. It will do a good job. Thirty-one of last sixty-one wildcat prospects located and recommended made commercial oil fields.

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COMPLETE PIPE-THREADING shop. Two Landis machines 13⅜" and 7", with building, fully equipped. Bargain. Phone Diamond 3-9563. Lundquist, Box 1215, Tulsa, Oklahoma.

NEW ¾" HPR-10 and HPR-20 Cast Bronze Reliance Regulators. Excess from construction. Priced to sell. Write for full details. Southeast Alabama Gas District, Box 271, Andalusia, Alabama.

COMPLETE carload ethyl plant dismantled and ready to load. Bargain price. Box 1858, W. C. Berry, Tulsa, Okla.

HEAVY DUTY 19' all steel tandem oilfield bed with Braden M30-144 winch, complete. Grant rolling tailboard and Texas poles. Priced to sell. Edd Noland, Box 229, Phone 102, Chanute, Kansas.

N-3 BREWSTER Drawworks complete with 1 GZBU Waukesha 20 months old—excellent condition. Price $13,750.00. Contact IVERSON SUPPLY COMPANY, Odessa, Texas. Phone FEderal 7-2349.

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FOR SALE: 600 tons Carnegie MP-115 42 ft. & Larssen Section II 30 ft. and 40 ft. lengths steel sheet piling located New Orleans and Tampa. Seaboard Steel Company, Tel. RIngling 7-0461, Sarasota, Florida.

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TWO COMPLETE DRILLING RIGS
NATIONAL—110—purchased Aug. 1955.
CLARK—PR-1,000
Both rigs complete in every detail—inventory on request. Have been drilling W. Tex., now stacked. H. R. Dickerson, Pres., **SABINE DRILLING CO.**, 814 Commercial Nat. Bk. Bldg., Shreveport, La., Phone: 3-5285.

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1—Wyatt 30" x 70' Stabilizer 160# 30 tray
1—5' x 98' tower, 40 tray, 135# WP.
1—2' x 50' tower, 24 trays.
1—Ethyl lead plant.
2—Upshot heaters, 10 mil. BTU/hr.
8—Welded storage tanks, 5,000, 2,000 bbl.
8—Hi-vol pumps, 10 x 7 x 18, 10 x 6 x 13, 6 x 4 x 12, 6 x 3 x 8.

IN STOCK

VESSELS

2—12' x 45' Storage Tanks, 25#
1—14' x 21' Clay Tower, 125#
1—8' x 75' Tower, 20 Trays, 25#
1—18" x 32' Tower, 15 Trays, 160#
2—8½' x 25' Tanks 80#
5—Packed Towers 14" x 40', 18" x 23', 160# Wyatt 1950.
1—Poly Reactor, 550#, 24" x 28'.

HOT-OIL PUMPS

3 Pacific ITB, 480 gpm—2,000' hd, 735 gpm—3,100' hd.
3 Pacific SVTB, 612 gpm—600' hd, 324 gpm—480' hd, 308 gpm—516' hd, 193 gpm—389' hd.
1 Pacific HVTB (unused) 1270 GPM—408' Hd. 8J hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.

HEAT EXCHANGERS

4—Kellogg Adm. Flg. Hd. 2200, 1300 Sq. Ft., 315#
4—Kellogg Stel Flg. Hed. 800, 650, 500 Sq. Ft.
18—GR Fin Tubes, 73 Sq. Ft.
6—Brown fintube exchangers, 300# 140 Sq. Ft. 4-6 chrome.
5—Steel 1,000, 900, 800, 600, 500 Sq Ft.
6—Adm. 785, 742, 425 Sq. Ft.
30—304 SS shell & tube condensers 100-1000 Sq. Ft.

COMPRESSORS

1 Worth LTC-6 800 hp.
3 Penn Comps 100 CFM 500 lbs.
385 CFM 160 lbs.

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6—Bird Centrifugals 32 x 50, 24 x 38, 18 x 28.
5—Sweetland Filters No. 12, No. 10, No. 7, No. 5.
4—Rotary Vac. Filters, 10 x 12, 8 x 10, 5 x 8.
Lab Petro-Chem furnace 50,000 BTU/hr
Tremendous selection stainless steel and steel valves 1½"-8".
Goulds 16" pump, 10,500 gpm, 135' hd.

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C-34 WALKER-NEER Spudder, with or without 5-7 tools. A-1 condition. Fully equipped. Located at Drumright, Oklahoma Box 788 or phone 20, Drumright.

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Widest Range of Sizes & Specs in the U. S.

WRITE FOR STOCK LIST

MIDCONTINENT TUBE SERVICE, INC.
2308 Oakton St., Evanston, Ill. DA 8-4030

FOR SALE EQUIPMENT

FOR SALE: Three Type 80 Cooper gas compressors complete with building. Alfred B. Kern, 305 Kennedy Building, Tulsa, Oklahoma.

PRICED TO SELL. Cardwell RL Spudder, rated 7500' drilling, powered Waukesha 200 HP engine, good cables. Pressey & Son, Pueblo, Colo.

FOR SALE: 1—50 H.P. 72" Stroke Twin Crank Parkersburg Pumping Unit, with 60 H.P. 4-Cylinder Waukesha Engine. 1—50 H.P. 74" Stroke Twin Crank O.C.S. Pumping Unit with 6MCAU Waukesha Engine. 1—#TC-33-22E 29 H.P. 54" Stroke Twin Crank Lufkin Pumping Unit with VIKU Waukesha Engine. 2—D-80 16.8 H.P. 48" Stroke Twin Crank American Pumping Units with ZC-346 Fairbanks-Morse engines. Overton Supply Co., Overton, Texas.

FOR SALE EQUIPMENT

FOR SALE: Bell and Gossett Heat Exchanger, Type OCZ-181 E Straight Tube. Shell 16" x 12' long, capacity, 606 GPM with 50' head at 125# W.P. The tube bundle is new and contains 345—⅝" OD x .035" x 147⅝" long copper tubes. Located at Centralia, Illinois. Contact Shell Oil Company, Mayo Building, Tulsa, Oklahoma, or Petroleum Building, Centralia, Illinois.

FRANKS IMPROVED MODEL 7000 Double Drum Workover Unit complete with Telescoping Derrick mounted on 6x6 FWD Truck for sale by sealed bid.

For additional information call or write

Sohio Petroleum Company (WEHLU)
Route 2, Box B-58, Edmond, Oklahoma.

Phones: 1080 Edmond
VI 3-5343, Oklahoma City.

LIQUIDATION—Drumright, Okla.

TIDEWATER OIL COMPANY

Modern 15,000 Bbl./Day Refinery

Presently being dismantled — Immediate removal and shipment — exceptional prices

HOUDRIFLOW CATALYTIC CRACKING UNIT, 8800 BBL./DAY (NEW 1952)

TOWERS

8'x5'x85'6" 25 Trays 250 PSI
8'x34'6"x½" 10 Trays
6'x30'x½" 9 Trays
4'6"x30'5"x⅜" 14 Trays
4'x49'6"x⅜" 24 Trays 330 PSI
3'x69'6"x½" Raschig Rings 200 PSI
3'x23'6"x1¼6" Catalyst 600 PSI (2)

ETHYL BLENDING PLANT 8500 GAL. COMPLETE SKIMMING POND

VESSELS

6'x40' SOAKER, 500 PSI @ 850° F.
20'x28'4" AGITATOR, cone bottom
10,000 bbl. HORTONSPHERE
6500 gal. PROPANE TANK

50,000#/HR. COCHRANE WATER TREATING AND DEAERATING PLANT

HEAT EXCHANGERS

Sq. Ft.	Type	Tubes	Shell
1080	Reflux	Adm. 125#	Steel 250
993	Reboiler	Steel 600#	" 600
970	"	" 125#	" 250
750	"	" —	—
331	16-138	Adm. 250#	Steel 250
331	16-138	Adm. 125#	" 250
Brown	Fintube	Steel 600#	(11)

110,000 GAL. FOAMITE SYSTEM—COMPLETE

VACUUM CRUDE DISTILLATION UNIT, 15,000 BBL./DAY (NEW 1953)

FURNACE TUBES

500—New Croloy #5, 3" to 6⅝" OD 15' to 32' long
500—4", 4-6% Chrome, headers
200—4½", 4-6% Chrome, headers
200—5", 4-6% Chrome, headers

UPSHOT HEATER COIL TYPE "D" 3" PIPE 600 PSI—417 SQ. FT. GAS FIRED

PUMPS

HOT OIL 334 GPM, 1,000 PSI (2)
FIRE 2500 GPM at 426' head
CENTRIFUGAL from 60 to 1500 gal. from 40' to 655' head
STEAM—Hot Oil—Simplex—Duplex
PROPORTIONING—1 to 5 HP

2-28 SPOT CAR LOADING RACKS, CAPABLE 10 PRODUCTS EACH SPOT

OTHER ITEMS

1000 M CFD COOPER GAS COMPRESSOR
HEAT EXCHANGERS—196-3100 sq. ft. (25)
NEW STEEL STACKS—240'
53—STORAGE TANKS—1,000-100,000 bbl.
40—STORAGE TANKS—1,000-27,000 gal.
10 Ton OVERHEAD TRAVELING CRANE
PIPE—VALVES & FITTINGS—
MACHINE TOOLS—WELDERS—
HYDRAULIC JACKS—HAND TOOLS—
CHEMICALS, ETC.

TELEMATIC 48 TANK GAUGING SYSTEM

Your inspection invited—representatives on premises
Write - Wire - Phone for Complete Information, Catalog

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TULSA OFFICE—310 Thompson Bldg., Tulsa 3, Okla., Diamond 3-4890
DRUMRIGHT OFFICE—P. O. Box 587, Drumright, Okla., Phone 569

Drill Stem Testing Tools

Four (4) complete strings—trucks—hydraulic tools—clocks—anchor. Ready to put to work. Bargain for cash.

NATIONAL SERVICES, INC.
OKLAHOMA CITY, OKLAHOMA
Box 7223 Phone WH—2-8811

R. E. KERSHAW CO.
306 S. 4th St.
MUSKOGEE, OKLAHOMA

New Titpon Pipeline Line-Up Clamps

12—30"	w/Hyd.	Jack	$99.90
6—24"	"	"	80.10
15—18"	"	"	71.10
8—16"	"	"	66.60
2—36"	w/o	"	79.20
1—30"	"	"	73.80
1—24"	"	"	47.70
3— 4"	"	"	13.00

BARGAIN PRICE

New 222—4½" OD x 2⅛" Bore Hinderliter API Full Hole Rotary Tool Joints for 3½" OD API Internal Upset Drill Pipe.

CONTACT

EL PASO NATURAL GAS COMPANY,
c/o C. L. Klepper, Phone 2-7781 through May 4, KEystone 2-2911 May 5 and after, Box 1492, El Paso, Texas.

PIPE 1/8" thru 30

FASTER from FOSTER

TESTED & STRUCTURAL
Large Warehouse Stocks

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FOR SALE EQUIPMENT

FOR SALE: Bucyrus Erie 48L machine. Equipped with base, enclosure, ready to go to work, used as top to bottom hole drilling unit. Price $17,500. Mai Drilling Co., Russell, Kansas.

FOR SALE: 3—10' x 40' horizontal welded steel tanks with dished heads. Thickness of tank 4/10". Excellent condition. Now contain light diesel fuel. Two tanks located Shrimp Basin Brownsville; one tank at Turning Basin Port Isabel. Reply to Box 2011, Brownsville, Texas.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

FOR SALE

Complete rotary drilling rig. U-15 drawworks powered by 3—NKU Waukesha engines. Late style 133' Oilwell derrick with 7' 8" Oilwell substructure. 7¼" x 14" Oilwell 214-P mud pump. Double Shaffer blowout preventer. Drill pipe and drill collars are also available with this rig making it ready to move on location.

Also listed for sale is a clean D7 Caterpillar tractor, series 4T with an inside hydraulic 8' blade and a D7N Hyster worm driven winch. Serial #19131.

For further information concerning this equipment call

HENSON DRILLING COMPANY,
OR 2-4112, or write to Box 2192,
ABILENE, TEXAS.

PRIME
EXTERNAL UPSET
TUBING

300,000'

2⅜" OD 4.7# New E.W. Hydrostatically tested 3500 PSI Range 2 External Upset Ends T&C in carload lots only.

$51.00 CFT FOB MILL
$55.00 CFT DELD SOUTHWEST AREA

Sold on first come, first served basis.

WIRE OR PHONE ORDERS

(Other sizes tubing and casing available)

A. J. STRUBEL
4346 Murdoch
ST. LOUIS 9, MO.
DAY: PRospect 3-3020
NIGHT: FLanders 1-8152

FOR SALE EQUIPMENT

4 BEVELING MACHINES, late type complete with torches up to 8", $250.00 each. Redneb Pipe Co. P. O. Box 1798, Shreveport, La. Phone 4-7767.

WILSON GIANT Roadair Drawworks with 36" Hydromatic, 2—L3000 LeRoi engines, single pump compound, catheads, air compressor, etc. Completely overhauled. Top A-1 condition. Also 64B Oil Well drawworks with 36" Hydromatic, pump compound, catheads, 2—8 cyl. LeRoi engines. Both units reasonably priced. Liberal terms to responsible party. Rig Supply & Rental Co., Box 2406, Casper, Wyo. Phone 2-5870.

FOR LEASE OR SALE—Truck mounted rotary drills, water tanks, air compressors. Telephone TAylor 7-3216, Dallas, Texas, Walters Drilling Company.

NEW CHROME HEATER TUBES, 54 joints, 17 to 23' lengths, 2" O.D. x .238 Wall, Type 446 Stainless Steel, Seamless, 26.05% Chrome. Immediate Shipment. W. Russell Pryor, 2502 Robinhood Road, Houston 5, Texas. Phone JAckson 3-3132.

ONE GARDNER-DENVER Mud Pump, Model FQ-FXQ (7¾" x 10") Serial No. 110920. On short steel skids. 18 groove 53" shive. Good condition. Turner Equipment Company. Phone FE 7-6562—Nights FE 2-5751, Odessa, Texas.

VERTICAL MAGNETOMETER Temperature Compensated Ten Gammas Askania 1955, $1100.00. Calibrating coil, $125.00. Box K-155, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Late Model Cardwell Double Drum Spudders, Ser. #RL-666 and RL-701, complete with large inventory of tools and equipment (extra good). General Tool & Supply Co., Box 4387, Oklahoma City, Okla.

FOR SALE at Tallant, Oklahoma—3—8' x 20' shell, 23' overall vertical butane tanks. 7/16" shell and heads, manways, steel ladder and safety valve. Code welded, 100# WP PSI, test 150#, liquid capacity each 7500 gallons, $1750.00 each, or $5,000.00 for the three. Cities Service Oil—Patridge—Bartlesville, Oklahoma.

1—BS&B 40 CAR—
Double Track—
Safwalk Loading Rack

complete, slightly used, dismantled, excellent buy, cost today $9500.00, priced to sell, $1500.00.

A. A. GILBERT PIPE & SUPPLY COMPANY
P. O. BOX 986 PHONE LD-97
SHREVEPORT, LOUISIANA

EQUIPMENT WANTED

SIE SEISMIC Instruments. Please state year, model, condition and price. Mayes-Bevan Co., Kennedy Building, Tulsa, Oklahoma.

WANT 36L or 32 SPECIAL Walker-Neer on rental-purchase basis. Rig must be in top condition for major company operation. Semi-trailer mount, 5" and 7" tools for 3000 ft. drilling and workover. We can offer excellent opportunity to anyone caring to dispose of their rig on a one year payout basis. State price, terms you want, and location where rig may be inspected. Deal only with principals. Box K-149, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

PETROLEUM ENGINEER—Large and aggressive oil company has opening for petroleum engineer with three to four years drilling and production experience for Central Kansas District Office. Good opportunity for advancement with company having excellent employee benefits and rapid expanding operations. Furnish resume of experience and education. All replies confidential. Apply Box K-142, The Oil and Gas Journal, Tulsa, Oklahoma.

Medium Sized Construction Company Wants Experienced Construction Man:

Prefer man 34 to 39 years of age, preferably having engineering degree and experienced in estimating refinery, chemical plants and other industrial plant installations. Must be familiar with construction company organization in both office and field. Right man can become key figure in immediate company expansion. Salary commensurate with ability. Location S.E. Kansas.

Box K-146,

The Oil and Gas Journal,
Tulsa, Oklahoma.

REFINERY
ENGINEERS

Chemical & Mechanical
INSPECTORS & DRAFTSMEN

For engineering staff of new refinery near Hattiesburg, Miss., consisting of TCC, Fluid Coking, Alkylation, Platforming-Unifining, Sulfur Production, Treating, and fractionation facilities.

Chemical Engineers:

1 - 5 years experience technical service, process design, and economics.

Mechanical Engineers:

2 - 8 yrs. experience design and construction of refinery facilities, and estimating.

Inspectors:

Experienced in equipment inspection and maintaining of inspection records.

Draftsmen:

Experienced in refinery engineering drafting.

Write, giving details of experience and applicable information, **immediately**, to:

Pontiac Eastern Corp.
P. O. Box 55
PURVIS, MISSISSIPPI

LIQUIDATION 11,000 BBL. REFINERY

D-X SUNRAY OIL CO., ALLEN, OKLA.

We are now liquidating this modern refinery and can offer equipment at a fraction of its cost.

INCLUDED ARE: 6 Heaters with Chrome Tubes, Welded Towers from 2' to 8' with Operating Pressures up to 475 psi., Reboilers, Accumulators, Heat Exchangers, Hot Oil Pumps, Centrifugal and Steam Pumps, Boilers, Gas and Diesel Generator Sets, New Chrome Heater Tubes, Pipe, Valves, etc.

Your Inspection Is Invited. Write for Catalogue.

HEAT & POWER CO. Inc., 60 E. 42 St., New York 17, N. Y.
310 Thompson Bldg., Tulsa 3, Okla.

HELP WANTED

ESTABLISHED, well-regarded oilfield equipment manufacturer desire the services of Petroleum or Mechanical Engineer to head product development program. Must have talent for design and ability to conceive and develop new ideas. Major oil company experience desirable. Good opportunity for right man. Salary open. Please give full information. Replies held in strictest confidence. Box K-131, The Oil and Gas Journal, Tulsa, Oklahoma.

Insurance Specialist - Attorney

Independent California Oil Company

Excellent opportunity for a combination overall insurance man and attorney with oil experience, under forty years, for employment by substantial independent integrated California oil company. Insurance activities will require about twenty per cent of time — balance will be handling marketing and general legal matters (no litigation). Salary commensurate with experience and ability. If applicant now employed, replies will be kept confidential.

Write to Dept. 24 ISA, P. O. Box 226, Church Street Station, New York 8, N. Y.

PROCESS ENGINEER

We urgently need a chemical engineer with 3 - 10 years refinery experience who has the ability to think for himself and work without close supervision. Job includes pilot unit supervision and startup of commercial refinery process units. About 30% travel.

Small aggressive engineering company that is on the move. Located in Houston, Texas.

Send complete details in first letter to

Box K-157,
The Oil and Gas Journal,
Tulsa, Oklahoma.

HELP WANTED

CHEMICAL ENGINEER. Independent Oil Company needs Chemical Engineer under 35 with general knowledge of, and experience in construction, operation, and maintenance of gasoline plants, gathering systems, compressor stations, gas pipe lines, and related facilities, for permanent position in Louisiana. Knowledge of process engineering also helpful. Furnish information as to education, family status, work history, and salary requirements to P. O. Box 2162, Dallas 21, Texas.

CHIEF ACCOUNTANT

Well qualified chief accountant with oil accounting, I.B.M. and tax experience needed by active independent oil company in Houston. C.P.A. qualifications desirable, good salary, opportunity for advancement. Replies treated confidentially.

Box K-139, The Oil and Gas Journal, Tulsa, Oklahoma.

SOUTH AMERICA

- Career employment with Major American Oil Companies • Salaries Open • Cost of Living Allowance • Monthly Bonus.

NO U. S. INCOME TAX
OUR FEE AND TRANSPORTATION PAID
Maximum Age to 40

- ENGINEERS, ALL TYPES—Degree required. Exp. or inexperienced.
- GEOLOGIST, Deg.—Age to 32. Single.
- TOOLPUSHERS, 3 to 5 yrs. experience.
- MECHANIC GAS, 5 yrs. experience.
- MECHANIC DIESEL, 4 yrs. experience.
- FOREMAN CONNECTION, 3 yrs. experience.
- FOREMAN ELECTRICAL, 3 yrs. experience.
- SUPERVISOR, OIL HANDLING, 3 yrs. Must have field experience.
- MUD TECHNICIAN, 1 yr. experience. Age to 32.
- TEACHER-PRINCIPAL, Male. Must have B.S. in education.
- STENOGRAPHER, Male. 1 year experience. Age to 32. Must be single.

All information confidential.

Send complete resume to:
OVERSEAS EMPLOYMENT SECTION

CHAS. J. LOVELESS PERSONNEL SERVICE
616 S. Main • Tulsa, Okla. • GI 7-3193

HELP WANTED

DISTRICT GEOLOGIST: Established independent desires geologist experienced in all phases of petroleum exploration, must have chief geologist qualifications. State salary and resume. Box K-145, The Oil and Gas Journal, Tulsa, Oklahoma.

DEVELOPMENT GEOLOGIST to develop reservoir geology of producing fields and recommend drilling programs; experienced in logging and testing techniques. Initial work in South Texas with eventual coverage of North America. Box K-151, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS WANTED: By crude oil pipe line operating company for general engineering. Applicants not over 30 years of age and must have a recognized degree in engineering from an accredited engineering school. Experience not essential. Salary based on experience and qualifications. When making application, please furnish resume of experience record, personal data, and copy of college transcript. Reply to EMPLOYEE RELATIONS DEPARTMENT, Interstate Oil Pipe Line Company, P. O. Box 1107, Shreveport, Louisiana.

Operations Engineer

Independent oil company has opening for petroleum engineer with four to seven years experience both technical and administrative for responsible position in planning and control. Knowledge of operating procedures, some valuation work and practical oil and gas law would be desirable. Excellent growth opportunities. Please furnish complete details on qualifications, including starting salary required.

Box J-987,
The Oil and Gas Journal,
Tulsa, Oklahoma.

LANDMAN

Experienced, preferably with geological background, for Independent Oil Company. Must know Mid-Continent Area and have experience in assembling deals and making trades. Age limit 40. Salary commensurate with ability and experience. All replies confidential. Give previous experience, education, and qualifications. Reply:

BOX K-160,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

COMPRESSOR STATION ENGINEER

Large gas utility in Great Lakes Area, needs graduate engineer, preferably under 40, with some compressor station experience.

Assistant to Superintendent in design, field engineering and other problems related to maintenance and operation of stations.

Liberal benefits. Salary in line with education and experience.

State personal and educational qualifications.

BOX K-152,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

GULF OIL CORPORATION
— ENGINEERS —

PETROLEUM
GAS
DRILLING

RESERVOIR
MECHANICAL
PIPE LINE

Subsidiary operating in Venezuela has opportunities for engineers with/without experience. Salary commensurate with experience.

P. O. BOX #35
Bowling Green Station, New York 4, New York

Automotive or Chemical Engineer

Position open for graduate automotive or chemical engineer with knowledge of gasoline behavior research. The work is varied in nature and requires capable man to coordinate research, author technical publications and maintain contacts within the industry. Position offers immediate responsibility in a growing technical service activity. Location in a Detroit suburb offers ideal professional environment with a choice of city or suburban living. For more particulars send name and address to:

PERSONNEL MANAGER
ETHYL CORPORATION
1600 W. 8 MILE ROAD
FERNDALE 20, MICHIGAN

HELP WANTED

FOREIGN EMPLOYMENT. List oil companies, drilling contractors, seismograph contractors, showing where apply foreign jobs. $5.00 cash. OIML Co., Box 2603, Tulsa, Okla.

EXECUTIVE
California Oil Company

Applicant would work directly with President and in addition to handling general problems involving all phases of integrated oil business should be able to handle financial matters including financing service stations. Should be C.P.A. or have accounting and analysis experience with oil company. Unusual opportunity for right man (who should be under 50) and could lead to key position with company that is expanding operations in both United States and foreign areas. Salary to start $20,000 to $25,000. If applicant now employed, replies will be kept confidential.

Write to Dept. 24-EC, P. O. Box 226, Church Street Station, New York 8, N. Y.

Petroleum Engineering Graduate

Preferably with some oil field experience in the Southwest who may be interested in reservoir study, pressure maintenance, water flooding, gas repressuring, field supervision, core analysis, and appraisal work in conjunction with our small well established consulting petroleum engineering firm in North Texas. Adequate compensation with advancement. Include personal data, snap shot, oil field experience, scholastic standing, when available, marital status, draft or service prospect, etc., in your letter to

BOX K-156,
THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

Petroleum Refinery Chemical Engineers

Positions involving technical service and consulting type work for petroleum refineries are available in refinery technology division. Chemical engineers working in refinery process engineering or operation and economic analysis are well qualified for these positions. Positions offer a wide variety of work assignments in an expanding technical activity that works with sales, research, refinery, and company management problems. Positions also afford opportunities for industry-wide contacts with refining and process companies and for using initiative and individual expression to increase responsibility. Location in a Detroit suburb offers ideal professional environment with a choice of city or suburban living. For more particulars send name and address to:

PERSONNEL MANAGER

ETHYL CORPORATION
1600 W. EIGHT MILE ROAD
FERNDALE 20, MICHIGAN

THE POSITION YOU WANT: Oil Industry companies are looking for men to fill every conceivable kind of position. If you didn't find the position in this column that you are looking for, use a "Situation Wanted" classified advertisement to state your qualifications. Some company is probably looking for your ability. See box heading for classified rates or write The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

GEOLOGIST, 33, eight years diversified exploration and administrative experience with Major in North and South Texas and Texas Gulf Coast. Desires change to aggressive Company other than Major offering responsible position. Box K-162, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

REFINERY MANAGER or administrative assistant. Experienced operations (modern processes), administration, economics, planning. Degree. Prefer Gulf South. Box K-159, The Oil and Gas Journal, Tulsa, Oklahoma.

CHIEF PIPELINE ENGINEER: Registered, diversified experience in design, construction and operation of crude, product and gas pipelines and stations. Now residing in South America, would prefer relocation in Guatemala, Bolivia, Chile or Venezuela. Willing to travel. Box K-158, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST - PALEONTOLOGIST, M.A., 39, married, native born, seeks foreign employment. Eight years varied experience with major oil company, independents, state survey and teaching. Speak Spanish, read French & German. W. R. Oglesby, 6040 St. Charles Avenue, New Orleans, La.

PETROLEUM ENGINEER-Production Superintendent: 25 years experience in administration, all phases drilling, well completions, production valuation, reservoir analysis. Capable of managing entire operation. Experienced in Oklahoma, Kansas and Texas operations. Desire connection with Independent Operator. Box K-150, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, 33, B.S. Degree, married, seven years broad experience in production, drilling, workovers, evaluation. Desires permanent position with good opportunity in substantial organization. Presently employed as production manager for independent producing company in Tulsa. Box K-147, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: Desires affiliation with aggressive independent or small company offering opportunity for financial improvement and for the experience. B.S. degree, 10 years diversified exploration experience in Texas, Oklahoma and Louisiana. Currently employed. Age 34, married. Reply P. O. Box 2075, Dallas, Texas.

PETROLEUM ENGINEER: 10 years oil and gas production experience in field and main office. Independent company knowledge of operations, planning and costs, reserve work, contracts, management problems. Four years in Wyoming and Colorado. Desire return to higher climate. Prefer Denver area with growing independent. Last year's compensation, $10,000 plus trust fund benefits. Box K-161, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

PRODUCTION WANTED

WANTED FOR CASH—Depleted and Marginal Wells for Salvage. Frank J. Black, P. O. Box 150, Phone 107, McPherson, Kansas

WANT TO BUY—Oil Properties, settled or semi-settled production. 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma.

PRODUCING oil, gas properties, also royalties wanted. Any size, any amount. Complete details in first letter. Box 231, Scarsdale, N. Y.

WANTED: Oil or gas production, any size, prefer, Okla., N. M., Tex., Colo. or Kan. B. Thurston, 1427 Princeton NE, Albuquerque, N. M.

WANTED—Oil or gas properties in South Texas or Gulf Coast. Please send complete details in first letter. P. O. Box 1927, San Antonio, Texas.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that approximately 2198.61 acres of land in 27 parcels within the known geologic structures of the Mush Creek, Skull Creek, Southeast Skull Creek, Clareton, and Fiddler Creek fields, Weston County, Wyoming, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre through sealed bids on or before June 5, 1957, when bids will be opened. Details of the lease offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Craig A. Decker, Manager.

ROYALTIES

OFFERING CHOICE ROYALTIES. You can now make very small investments on income Royalties or those ahead of drilling. A. S. Berry, 520 Wright Bldg., Tulsa, Okla.

LEASE AND DRILLING BLOCKS

WANTED TO SELL—some interest in an Oil & Gas Lease in the Grass-Root area of Craig County, Oklahoma. This Lease joins Production and looks very favorable. You can get in worth the money if you are interested. Write W. P. Horn, Box 216, Coweta or call Phone IV-6-5439, Coweta, Okla. Will be glad to show you the lease on appointment.

AN OIL MAN'S DREAM. 240 acres. Offsets production, 2 sides. 6 probable producing sands to 2820 feet including Wilcox. Only 30 miles NW of Tulsa, just south of Osage County. Splendid Geology & Pipe Line Titles, this 240 acre lease block is ready for the rig. Easy Drilling. Well must start by June 17th, 1957 to drill to Wilcox Sand or 2820 feet. Drill this one and cut out most of dry hole risks. Probable Layton, Skinner, Red Fork, Wilcox Production. Only $8.00 acre & 1/8th Override. $12.00 & 3/64ths, $15.00 acre & 1/2nd override. Don't wait, wire, write, Box K-148, The Oil and Gas Journal, Tulsa, Oklahoma.

OIL, GAS AND MINERAL LEASES available in Dell City area of Hudspeth County, Texas. U. S. Geological Survey Map shows anticlinal axis nearby favorable for oil-gas structure. Am fee landowner of over 2000 acres. Write quickly to: Jefferson G. Smith, 215 Littlefield Building, Austin 15, Texas.

OIL LEASES IN BOOMING

4-Corners Area. November Indian Lease sale brought 30 Million Dollars. Some leases sold for $3,200 per acre. Wells estimated up to 1500 barrels of oil per day. Oil Leases from $2.25 an acre. Fortunes being made. Write for free information now. **ATLAS OIL SURVEY, Dept. OJ-5, Colorado Bldg., Denver 2, Colo.**

INVITATION TO BID

The Arkansas Tuberculosis Sanatorium owns approximately 3800 acres of minerals under an approximate 7300 acre surface which it desires to lease for exploration for oil, gas and/or other minerals.

Details may be obtained by writing the undersigned.

T. H. LIPSCOMB,
SUPERINTENDENT
Arkansas Tuberculosis Sanatorium
STATE SANATORIUM, ARKANSAS

MAP CABINETS

END MAP-FILING WORRIES FOREVER! Kraftbilt Rollfiles keep rolled maps safe from dust, dampness, pilferers. Used by all major and hundreds of smaller oil companies. Send for new Catalog 1156-B, Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Okla.

SCOUTING

VENEZUELAN OIL SCOUTING AGENCY

Reports—maps—newsletter
Cable: VOSA, Caracas
Mail: Apartado 3963
N. VanMiddlesworth
Phone: 54 48 02

SALES AND SERVICE

SALES REPRESENTATION—
FOUR CORNERS

Sales and Service firm with office and warehouse facilities in middle of Farmington supply area interested in additional line for drilling and producing operations. Consigned stocks only.

Box K-153, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT MEN... in the News

Seismograph Service Promotes Four Officials

E. D. Wilson, F. B. Leedy, Howard R. Breck, and R. K. Finley have been promoted by Seismograph Service Corp., Tulsa, according to G. H. Westby, president, following a meeting of SSC's board of directors.

Wilson, assistant treasurer, was named treasurer of SSC. He will fill the treasurer's post formerly held by Leedy. Leedy, who in addition to treasurer has been vice president of Seismograph Service Corp. (International) operating in Brazil, also was named vice president of Seismograph Service Corp. of Canada. This change will free Leedy for duties in connection with SSC's activities in Canada and Brazil.

Breck, manager of the continuous velocity logging division, was promoted to assistant vice president in charge of CVL, and Finley, manager of maintenance and assembly, to assistant vice president in charge of manufacturing.

Wilson, with SSC 11 years, has been in charge of accounting for the parent company and 13 subsidiaries. Breck, who joined SSC in 1937, has served as seismic computer in Trinidad and Venezuela; seismic party chief, and supervisor in Venezuela. Since 1947 he has served in Tulsa as supervisor in equipment, personnel and training; seismic interpreter, seismic supervisor in the Mid-Continent area and manager of the company's short-term contract department. He was named head of CVL in 1954.

Finley, who joined SSC in 1937, has worked successively as observer helper, shooter, junior observer, instrument supervisor; in 1950 was named research engineer and later that year production manager. In 1951 he became manager of manufacturing and supply.

NAMCO Is Joint Endeavor Of Geophysical Companies

A new organization, known as NAMCO International, has been formed by three geophysical companies to provide world-wide geophysical exploration services. The new organization represents the combined facilities and services of National Geophysical Co., Inc., Dallas, Tex.; E. V. McCollum & Co., Tulsa; and Continental Geophysical Co., Fort Worth, Tex. Headquarters for NAMCO will be in Dallas.

According to John Gillin, president of National Geophysical, each of the concerns involved will continue to operate as an independent company in handling of domestic and Canadian geophysical work but will pool resources for international activities.

Principals of the new organization are John Gillin, president, and W. R. Mitchell, executive vice president, National Geophysical Co., Inc.; E. V. McCollum and Craig Ferris, partners of E. V. McCollum Co.; and A. E. (Sandy) McKay, president of Continental Geophysical Co.

Oil Well Engineering Names American Representative

Joseph North has been appointed representative in America of Oil Well Engineering Co., Ltd., Stockport, England. He succeeds D. F. O'Connell who has resigned. For the past 10 years North has been the company's deputy representative in New York.

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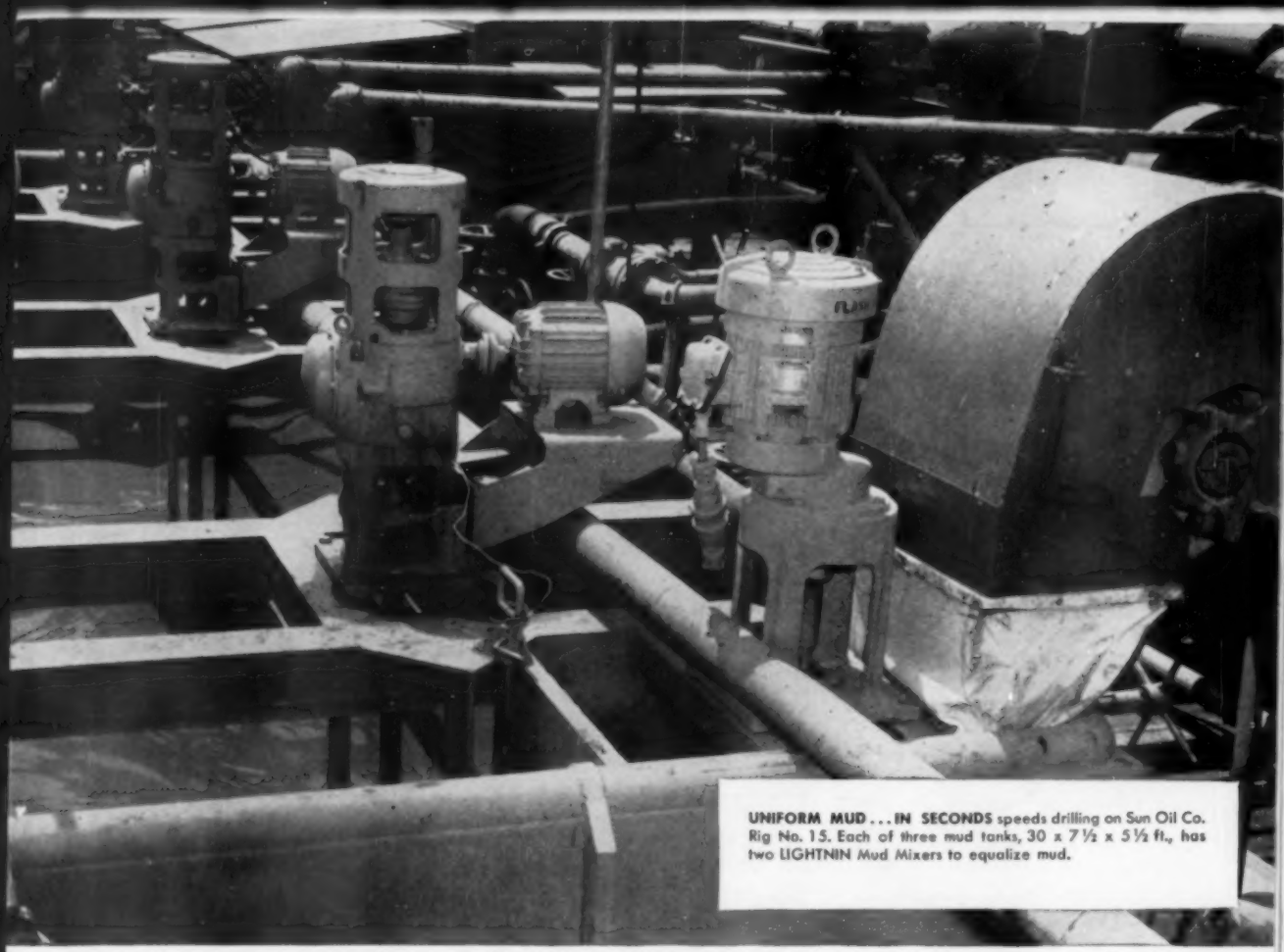

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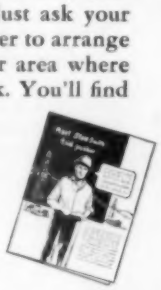

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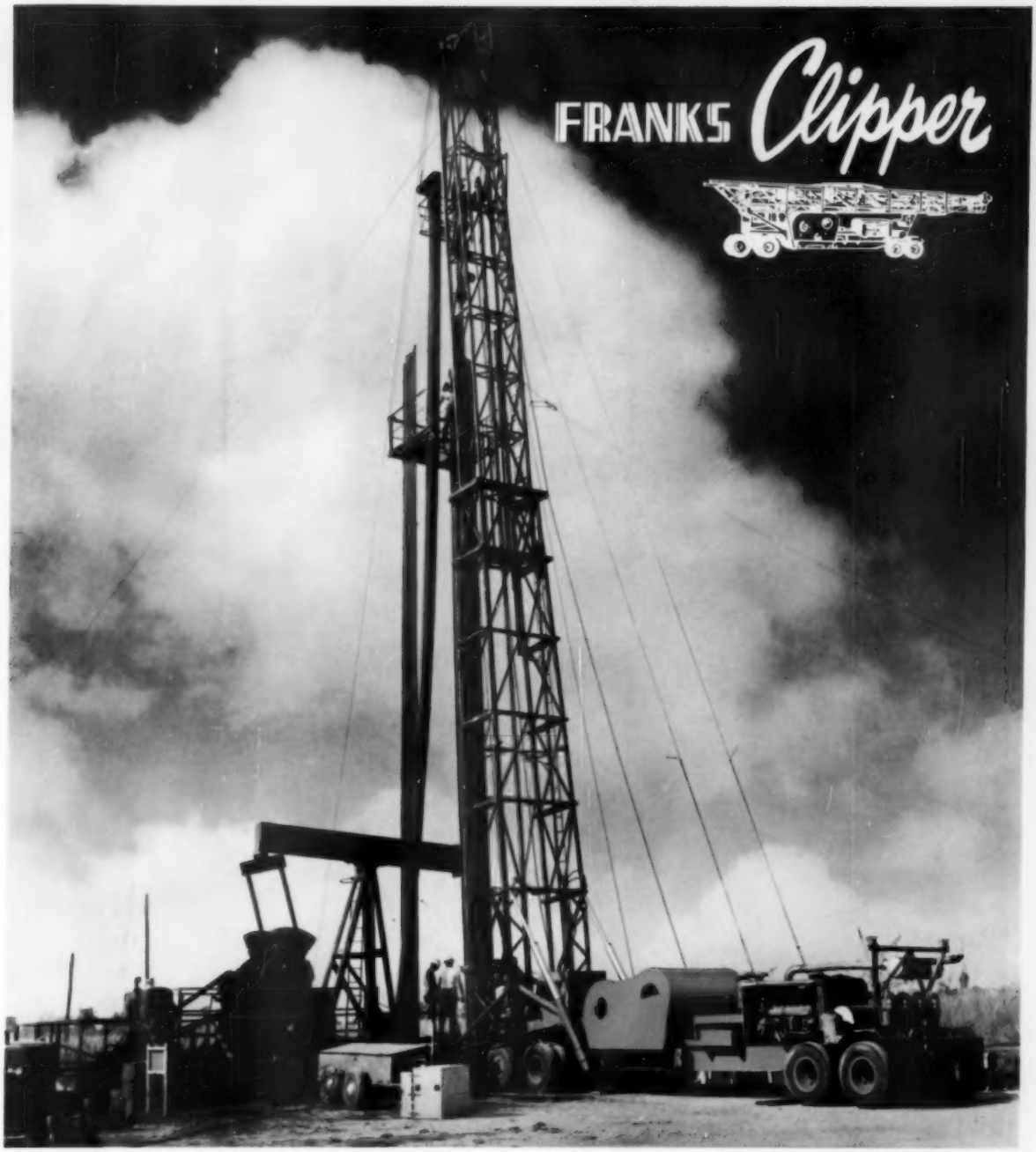

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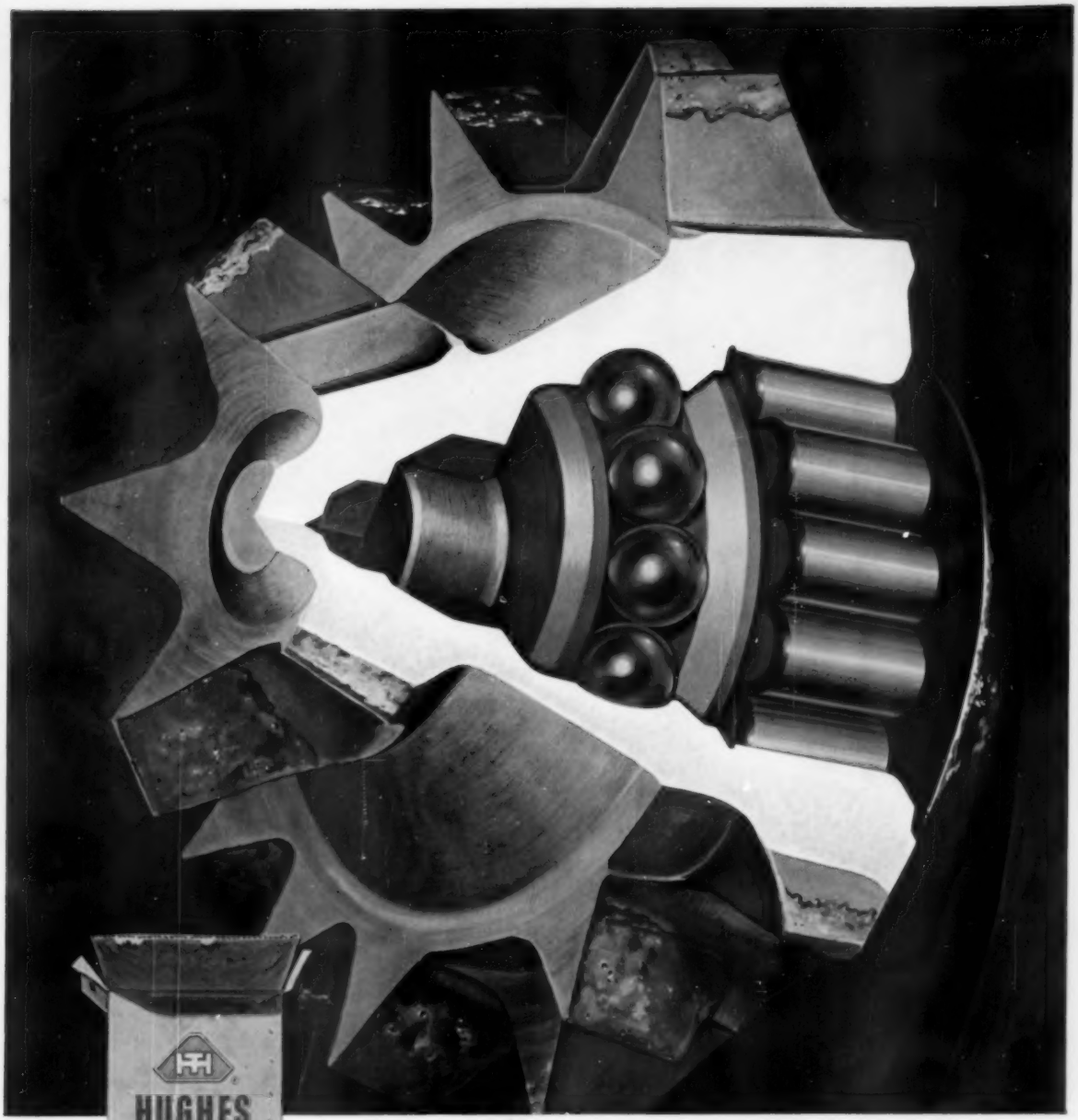

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